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East Coast Newfoundland Herring - 1983 Assessment

by

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Abstract

Analysis of data collected during 1983 is presented for east coast Newfoundland herring stocks. In previous analyses, the area has been assessed as four stock complexes: 1) White Bay-Notre Dame Bay; 2) Bonavista Bay; 3) Trinity Bay; and 4) Conception Bay-Southern Shore. This year, after detailed analysis of several tagging experiments conducted during the 1970's, Bonavista and Trinity bays were combined, and the east coast was assessed as three stock complexes. Landings in 1983 were approximately 500 t and came from a bait fishery and as a by-catch in the capelin and mackerel fisheries. There was no directed commercial fishery in 1983. Samples from the bait fishery showed the continued dominance of age 11+ fish in all areas. However, samples from the research gillnet program showed some recruitment of younger age groups with the 1979 year-class representing approximately 30% of the catch. A purse seine survey also showed significant concentrations of 1982 year-class in all areas. Catch rate information, available from the research gillnet program, showed decreased catch rates from 1980 to 1981 or 1982 and an upward trend in 1983. Total mortality coefficients ($\bar{Z}$) were calculated but as there were no trends it was impossible to obtain a best estimate of F_t with which to run cohort analysis. However, trial cohort runs were conducted using two options of F_t: $F_t = 0.028$ which was felt to reasonably reflect fishing mortality in 1983, and $F_t = 0.056$ which was felt to provide an upper bound to the probable fishing mortality in 1983. Trends in biomass, fishing mortality and recruitment were examined and management considerations are provided for 1984 and 1985.

Résumé

On donne ici les résultats d'une analyse des données recueillies en 1983 sur les stocks de harengs de la côte est de Terre-Neuve. Dans les analyses précédentes, la région avait été évaluée comme comprenant quatre complexes de stocks : 1) baie Blanche - baie Notre-Dame; 2) baie de Bonavista; 3) baie de la Trinité; 4) baie de la Conception - côte sud. Cette année, après une analyse détaillée de plusieurs expériences de marquage menées durant les années 1970, les baies de Bonavista et de la Trinité ont été fusionnées et la côte est considérée comme comprenant trois complexes de stocks. Il a été débarqué environ 500 t en 1983, en provenance d'une pêcherie pour la boëtte ou encore de prises secondaires dans la pêche du capelan et du maquereau. Il n'y a pas eu de pêche commerciale dirigée vers le hareng en 1983. Des échantillons de hareng à boëtte indiquent toujours la dominance des poissons d'âge 11+ partout. Cependant, des échantillons provenant d'une pêche expérimentale aux filets maillants laissent entrevoir un certain recrutement de groupes plus jeunes, la classe de 1979 formant environ 30 % des prises. Un relevé à la senne coulissante montre aussi des concentrations significatives de poissons de la classe d'âge de 1982 dans toutes les régions. Les données recueillies dans la pêche expérimentale aux filets maillants montrent une diminution des taux de capture de 1980 à 1981 ou 1982 et une tendance à la hausse en 1983. Les coefficients de mortalité totale (Z) ont été calculés, mais, en l'absence de toute tendance, il a été impossible d'obtenir un meilleur estimé de F_t qui aurait permis une analyse par cohortes. Cependant, des analyses d'essai ont été menées avec option de deux F_t : $F_t = 0{,}028$ qui, à notre avis, reflète assez bien la mortalité par pêche en 1983 et $F_t = 0{,}056$ que l'on considère comme limite supérieure probable de la mortalité par pêche en 1983. Les tendances de biomasse, la mortalité par pêche et le recrutement sont analysés, suivis de considérations sur la gestion en 1984 et 1985.

Introduction

1) Historical and Present Fishery

The 1970's represented a period of rapid expansion in the herring fishery along the east coast of Newfoundland. In the early 1970's (1970-73), landings were low, averaging 3500 t annually, mostly from fixed gear. Landings increased to 25,000 t by 1976 with the recruitment of the very strong 1968 year-class, the involvement of the mobile purse seine fleet and the development of a fleet of small (< 65 ft) ringnet vessels. The mobile purse seiners were excluded from the east coast in 1977, the same year the ringnet fleet was first placed under quota control. Gillnets were not placed under quotas until 1980, with the result that gillnet landings increased rapidly from 3700 t in 1976 (approximately 15% of total landings) to 13,000 t in 1979 (approximately 50% of total landings (Tables 1-3). TAC's and thus landings were substantially lower from 1980-82 due primarily to poor recruitment subsequent to the 1968 and 1969 year-classes. Ringnets were excluded from the fishery in 1982 and the commercial fishery was closed in 1983, except to fixed gear bait permits and limited by-catches in the capelin and mackerel fishery. TAC's and landings ($x10^3$ t) are listed below for 1977-83.

	1977	1978	1979	1980	1981	1982	1983
TAC	22.0	17.4	20.8	9.8	7.0	2.0	0.0
Catch	25.7	23.4	26.4	12.4	9.0	2.6	0.5

2) Stock Delineation

Prior to this year, east coast Newfoundland herring were considered as four stock complexes for assessment purposes: 1) White Bay - Notre Dame Bay, 2) Bonavista Bay, 3) Trinity Bay, and 4) Conception Bay - Southern Shore (Wheeler and Winters 1980, 1981, 1982, 1983). However, after careful examination of tag returns of experiments conducted along the east coast from 1975-81 (Wheeler and Winters 1984), it was decided to combine Bonavista Bay and Trinity Bay (Fig. 1) as a single stock complex for assessment purposes. Tag recoveries from experiments conducted during the fall in Bonavista Bay were considerably higher in Trinity Bay in the spring than in the tagging area, suggesting a northward post-spawning migration of Trinity Bay herring into Bonavista Bay. Until evidence is available to show otherwise, east coast Newfoundland herring will in future be considered as three stock complexes: 1) White Bay - Notre Dame Bay (Areas A & B), 2) Bonavista Bay - Trinity Bay (Areas C & D), and 3) Conception Bay - Southern Shore (Areas E & F).

3) Research Purse Seine Charters

Similar to 1982, two commercial purse seine (< 65 ft) vessels were chartered for three weeks in October 1983. Approximately 1200 miles of

cruise track (Fig. 2-5) were covered in Notre Dame and Bonavista bays, at a speed of 2-4 knots, with continuous monitoring of both sonar and sounder. There were 30 successful purse seine sets (see Appendix 1); juvenile herring predominated the successful sets, 1983 year-class in seven sets and 1982 year-class in 21 sets. As was the case in the 1982 purse seine survey, the 1982 year-class appeared in significant concentrations in all areas surveyed as evidenced from the markings on Figures 2-5.

Input Data and Assessment Parameters

1) Age Compositions

The number of herring sampled in 1983 (Table 4) increased from 1982, even though there was a substantial reduction in commercial catch. This was due primarily to the increased number of research samples, both from the research gillnet program and the research purse seine survey.

The commercial catch at age data of each stock area was reexamined for 1980-83. In certain cases, research samples collected from commercial mesh size (2 1/2" and 2 3/4") gillnets were used to generate catch at age data where no commercial samples were available. This resulted in minor changes to the commercial catch matrices for 1980-83 (Tables 5-7).

Age distributions from the 1983 commercial (i.e. bait fishery) catch (Fig. 6) showed the continued dominance of age 11+ fish in all areas. In Areas A & B and C & D, the 1979 year-class showed marginal strength, representing 10% and 18% of the catch, respectively. In all areas, there was an increased percentage of autumn spawners in the catch, 10% in Area A & B and C & D and 66% in Area E & F. The percentage for Area E & F is suspect as the sample size was very small.

As would be expected, the age composition of samples from the research gillnet program (Fig. 7) showed increased proportions of younger age groups, since mesh sizes ranged from 2" to 3". In all areas, the 1979 year-class represented approximately 30% of the catch. The percentage of autumn spawners decreased slightly from 1982 to 1983 in Areas A & B and C & D. However, percentages increased from north to south (6% - A & B; 15% - C & D; 48% - E & F).

2) Age Specific Weights

As the number of samples collected during the first two quarters of the year was small, mean weights-at-age were derived from all samples collected during the year (Table 8).

3) Partial Recruitment Rates

Partial recruitment rates (Table 9) were changed from previous assessments to more accurately assess younger age groups and to account for a bait fishery prosecuted entirely by gillnets. Mean lengths-at-age were calculated from commercial gillnet samples for all areas combined.

Selectivity factors per cm length interval were calculated for a 2 5/8" mesh size gillnet (those predominantly used in the commercial fishery) by averaging selectivity factors for 2 1/2" and 2 3/4" gillnets as calculated by Olsen (1959). Adjustments were made at younger age groups to account for percent maturity as the fishery in most areas occurred on or near the spawning grounds. The respective selectivity factor per mean length-at-age was then used to initiate cohort analysis.

4) Abundance Indices

As there was no commercial gillnet fishery in 1983, other than a bait fishery, it was impossible to extend the gillnet purchase slip catch rate series as used in previous assessments.

The research gillnet program, initiated in 1980, was continued again in 1983, giving four years of catch rate information. In 1983, 11 east coast fishermen (see Table 10 and Fig. 1) were contracted to fish a fleet of five gillnets, ranging in mesh size from 2" to 3", for a period of one month (October or November), to maintain an accurate daily log record of catches and to collect and freeze samples from their catch.

However, due to a change in the depth of nets provided to certain fishermen in 1980-82, total catch (Table 10) and hence catch rates had to be adjusted before comparisons could be made. In 1983, three of the 11 fishermen fished two fleets of nets, one shallow (old type) and one deep (new type). Conversion factors (Table 11) were calculated for each area and for all areas combined.

It was decided to examine the research gillnet catch rates in four different ways:

A) adjusting by the weighted average conversion factor, where necessary, to account for shallow nets and using total fishing days as the unit of effort (Table 12);

B) adjusting by the individual area conversion factors and using total fishing days (Table 13);

C) adjusting by the weighted average conversion factor and using total number of days nets hauled as the unit of effort (Table 14);

and D) adjusting by the individual area conversion factors and using total number of days nets hauled (Table 15).

In most areas, using any of the four options, catch rates showed an upward trend in 1983, due primarily to the 1979 year-class. The general trend showed decreased catch rates from 1980 to 1981 or 1982 and an upward trend in 1983.

5) Calculation of Total Mortality (Z)

After examination of the catch-at-age data from the research gillnet program (Appendix 2), it was decided to calculate Paloheimo (1961) Z's for ages 3+ as in most cases, it appeared that full recruitment to the research gillnet occurred at age 3. As shown in Tables 12-15, there was no trend in calculated Z's for 1982-83 or 1981-83 for any of the four options. It was therefore impossible to obtain a best estimate of F_t with which to tune cohort analysis.

However, trial runs of cohort analysis were conducted for each of the stock areas using two options of F_t: 1) $F_t = 0.028$ and 2) $F_t = 0.056$ (Tables 16-21). These values were chosen as they produced weighted average F's of 0.025 and 0.050, respectively. It was felt that $F = 0.025$ reasonably reflected fishing mortality in 1983 and that $F = 0.05$ provided an upper bound to the probable fishing mortality rate in 1983 as the bait fishery in all three stock areas took a total of 500 t.

Assessment Results

1) Trends in Biomass and F

In all stock areas (Tables 16-21), biomass levels (2+, 3+, and 5+) tended to stabilize in 1983 at approximately the same levels as 1982, under either option of F_t. However, the 1982 and 1983 biomass estimates were still the lowest for the time series.

Fishing mortality (5+) estimates were low for all areas and showed the same trend as in the most recent cohort analyses for these stocks (Wheeler and Winters 1981) in which fishing mortalities peaked in 1979 and have since declined (Fig. 8). With the exception of Area E and F, fishing mortality rates have rarely exceeded $F_{0.1} = 0.30$, suggesting that stock declines have been mainly due to recruitment failure of year-classes produced during the 1970's rather than excessive fishing pressure.

2) Trends in Recruitment

Recruitment of the 1979 and 1980 year-classes is poor in all areas, however not to the extreme of the preceding 1977 and 1978 year-classes.

In Areas A & B, the strength of the 1980 year-class at age 2 is approximately equal to that of the 1976 year-class at age 2 in 1978. The 1976 year-class now represents approximately 4% of the 3+ population numbers in Areas A & B. Similarly, the 1979 year-class appears to be approximately 50% of the strength of the 1980 year-class.

Conversely, in Areas C & D the 1979 year-class is stronger than that of 1980. However, the 1979 year-class is still approximately equal to or marginally better than the 1976 year-class, which now represents approximately 3% of the 3+ population numbers.

In Areas E & F, the 1980 year-class is stronger than that of 1979; it is also approximately 1.5 times the strength of the 1976 year-class. However, the 1976 year-class presently represents only 2% of the 3+ population numbers.

Recruitment was also estimated for all east coast stocks combined, using an environmental model (Table 22 and Figs. 9 and 10). This model was developed initially for Fortune Bay herring (Winters et al. 1984) and essentially evaluated recruitment variability in relation to various environmental signals (temperature and salinity) and egg production. This procedure has been applied to recruitment levels of east coast herring for the years 1963-76 and a combination of temperature (Tempsum, six months before spawning) and salinity (mean of six months prior to and six months after spawning) was found to explain 75% of recruitment variability for the 1963-76 year-classes (Table 22). In Figure 9 the predicted values and their confidence limits are shown in relation to the observed values. Predicted values for the 1977-82 year-classes follow the same relative pattern as estimated by cohort analyses; however, the predicted values are considerably (although not substantially) higher.

Since squid is a known predator of juvenile herring, we have examined the pattern of residuals from the environmental model in relation to squid abundance for the year-classes 1972-81 (Anon. 1983). The residuals (Fig. 10) exhibit a highly significant negative correlation with squid abundance for both options of terminal F (F_t). Since squid abundance was extremely low in 1982 the predicted level of recruitment for the 1982 year-class is probably an underestimate.

Recruitment estimates derived from both options of cohort analysis (F_t = 0.028 and F_t = 0.056) were plotted against 5+ biomass levels (Figs. 11-13). Similar with other herring stocks, there was no relationship between spawning stock size and recruitment levels, suggesting that herring recruitment is largely controlled by environmental factors rather than egg production levels.

Discussion

For the first time since the mid 1970's, the future of the east coast Newfoundland herring stocks looks reasonably bright. Both qualitative estimates from research purse seine surveys and more quantitative estimates from the environmental model suggest that the 1982 year-class is at least of moderate strength. Initial observations of the 1983 year-class during the 1982 purse seine survey are also promising.

The low levels of catch in 1983 coupled with the marginal recruitment of the 1979 and 1980 year-classes have tended to stabilize biomass levels at approximately the same levels as 1982. However, these biomass estimates are still extremely low, and although there is no direct relationship between spawning stock size and recruitment levels, it is felt that present spawning stock biomass levels may be approaching the critical low levels below which recruitment is directly impaired.

The 1982 year-class appears to be of sufficient strength to ensure a substantial increase in the abundance of east coast herring within the next several years. However, these herring will not contribute significantly to the spawning stock until 1986 and from a yield-per-recruit viewpoint, will not achieve maximum biomass levels until age 5 in 1987. The production of the 1984 and 1985 year-classes will therefore depend both on environmental factors and the egg production of the 1969 and earlier year-classes, which have sustained these stocks in recent years. These older fish should be protected within the next two years to ensure that spawning stocks do not reach critical levels below which recruitment could be directly impaired.

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Table 1. White Bay (W.B.) - Notre Dame Bay (N.D.B.) herring landings (t), by gear, 1973-83.

Year	Area	Gear						Total
		Purse seine	Ring net	Mdwtr trawl	Bar seine	Gill - net	Trap	
1973	W.B.	1	-	-	35	552	229	817
	N.D.B.	1	-	-	20	1533	105	1659
	Combined	2	-	-	55	2085	334	2476
1974	W.B.	-	8	11	53	738	632	1442
	N.D.B.	-	6	-	85	2191	312	2594
	Combined	-	14	11	138	2929	944	4036
1975	W.B.	828	-	-	46	1209	329	2412
	N.D.B.	1183	108	-	12	1631	209	3143
	Combined	2011	108	-	58	2840	538	5555
1976	W.B.	1724	487	-	18	509	246	2984
	N.D.B.	2908	3412	-	589	2242	353	9504
	Combined	4632	3899	-	607	2751	599	12488
1977	W.B.	-	1228	-	39	268	240	1775
	N.D.B.	-	4961	-	2096	2438	355	9850
	Combined	-	6189	-	2135	2706	595	11625
1978	W.B.	-	1254	-	240	1133	331	2958
	N.D.B.	-	3980	-	306	5859	311	10456
	Combined	-	5234	-	546	6992	642	13414
1979	W.B.	-	832	-	9	978	64	1883
	N.D.B.	-	1968	-	2274	8971	598	13811
	Combined	-	2800	-	2283	9949	662	15694
1980	W.B.	-	747	-	-	1269	83	2099
	N.D.B.	-	913	-	727	2778	13	4431
	Combined	-	1660	-	727	4047	96	6530
1981	W.B.	-	220	-	14	646	23	903
	N.D.B.	-	1065	-	400	2209	107	3781
	Combined	-	1285	-	414	2855	130	4684
1982	W.B.	-	-	-	7	402	52	461
	N.D.B.	-	-	-	136	1425	1	1562
	Combined	-	-	-	143	1827	53	2023
1983*	W.B.	-	16	-	-	81	7	104
	N.D.B.	-	-	-	-	326	-	326
	Combined	-	16	-	-	407	7	430

* provisional

Table 2. Bonavista Bay (B.B.) - Trinity Bay (T.B.) herring landings (t), by gear, 1973-83.

Year	Area	Gear						Total
		Purse seine	Ring net	Mdwtr trawl	Bar seine	Gill-net	Trap	
1973	B.B.	5	-	-	23	479	2	509
	T.B.	156	-	-	199	340	5	700
	Combined	161	-	-	222	819	7	1209
1974	B.B.	-	-	-	21	611	10	642
	T.B.	-	428	-	154	976	93	1651
	Combined	-	428	-	175	1587	103	2293
1975	B.B.	1559	-	-	34	414	2	2009
	T.B.	1370	1790	-	242	411	90	3903
	Combined	2929	1790	-	276	825	92	5912
1976	B.B.	2812	3052	-	24	328	139	6355
	T.B.	1614	1054	-	465	419	30	3582
	Combined	4426	4106	-	489	747	169	9937
1977	B.B.	-	6223	236	2495	309	-	9263
	T.B.	-	1548	-	927	174	45	2694
	Combined	-	7771	236	3422	483	45	11957
1978	B.B.	-	4239	-	150	1320	3	5712
	T.B.	-	1055	-	966	308	8	2337
	Combined	-	5294	-	1116	1628	11	8049
1979	B.B.	-	3490	-	377	2374	4	6245
	T.B.	-	1181	-	1615	680	55	3531
	Combined	-	4671	-	1992	3054	59	9776
1980	B.B.	-	1714	-	652	1321	-	3687
	T.B.	-	964	-	405	336	13	1718
	Combined	-	2678	-	1057	1657	13	5405
1981	B.B.	-	1100	-	713	1399	7	3219
	T.B.	-	78	-	361	367	19	825
	Combined	-	1178	-	1074	1766	26	4044
1982	B.B.	-	-	-	-	386	4	390
	T.B.	-	-	-	25	76	6	107
	Combined	-	-	-	25	462	10	497
1983*	B.B.	-	-	-	-	52	-	52
	T.B.	-	-	-	27	17	-	44
	Combined	-	-	-	27	69	-	96

* provisional

Table 3. Conception Bay (C.B.) - Southern Shore (S.S.) herring landings (t) by gear, 1973-83.

Year	Area	Gear						Total
		Purse seine	Ring net	Mdwtr trawl	Bar seine	Gill-net	Trap	
1973	C.B.	211	-	-	491	181	83	966
	S.S.	18	-	-	157	170	-	345
	Combined	229	-	-	648	351	83	1311
1974	C.B.	48	2107	-	67	131	134	2487
	S.S.	-	32	-	14	72	86	204
	Combined	48	2139	-	81	203	220	2691
1975	C.B.	13	2281	-	388	166	24	2872
	S.S.	315	-	-	23	160	169	667
	Combined	328	2281	-	411	326	193	3539
1976	C.B.	-	1704	258	76	153	92	2283
	S.S.	-	44	-	-	8	149	201
	Combined	-	1748	258	76	161	241	2484
1977	C.B.	-	1248	-	58	174	12	1492
	S.S.	-	442	-	-	18	200	660
	Combined	-	1690	-	58	192	212	2152
1978	C.B.	-	1098	-	11	415	3	1527
	S.S.	-	133	-	14	78	193	418
	Combined	-	1231	-	25	493	196	1945
1979	C.B.	-	432	-	-	210	63	705
	S.S.	-	10	-	18	49	111	188
	Combined	-	442	-	18	259	174	893
1980	C.B.	-	319	-	16	107	1	443
	S.S.	-	-	-	-	2	32	34
	Combined	-	319	-	16	109	33	477
1981	C.B.	-	-	-	-	160	2	162
	S.S.	-	-	-	-	53	8	61
	Combined	-	-	-	-	213	10	223
1982	C.B.	-	-	-	-	84	1	85
	S.S.	-	-	-	-	7	5	12
	Combined	-	-	-	-	91	6	97
1983*	C.B.	-	-	-	-	17	-	17
	S.S.	-	-	-	-	-	-	-
	Combined	-	-	-	-	17	-	17

* provisional

Table 4. Number of fish sampled from the northeast Newfoundland herring fishery, by area and gear, 1980-83 (research samples in parentheses).

Year	Area	Gear type				Total # sampled	Comm. catch (t)
		Trap	Bar Seine	Gillnet	Ringnet		
1980	A	-	-	191 (1325)	-	191 (1325)	2099
	B	(100)	400	735 (1300)	(100)	1135 (1500)	4431
	C	-	650	100 (950)	1462	2212 (950)	3687
	D	-	650	149 (573)	788	1587 (573)	1718
	E	-	-	100 (48)	294	394 (48)	443
	F	-	-	-	-	-	34
	TTL.	(100)	1700	1275 (4196)	2544 (100)	5519 (4396)	12412
1981	A	-	-	(598)	-	(598)	903
	B	-	498	549 (1576)	1369	2416 (1576)	3781
	C	-	450 (150)	450 (731)	1545 (550)	2445 (1431)	3219
	D	-	398	200 (400)	350	948 (400)	825
	E	-	-	-	-	-	162
	F	-	-	-	-	-	61
	TTL.	-	1346 (150)	1199 (3305)	3264 (550)	5809 (4005)	8951
1982	A	196	-	(1133)	-	196 (1133)	461
	B	-	150	1000	-	1150	1562
	C	-	-	850 (1249)	-	850 (1249)	390
	D	-	-	10 (381)	-	10 (381)	107
	E	-	-	100	-	100	85
	F	-	-	-	-	-	12
	TTL.	196	150	1960 (2763)	-	2306 (2763)	2617
1983	A	-	63	376 (799)	22	461 (799)	104
	B	-	-	(1230)	200 (2927)	200 (4157)	326
	C	700	-	645 (1210)	-	1345 (1210)	52
	D	527	-	548 (678)	(700)	1075 (1378)	44
	E	326	-	50	(450)	376 (450)	17
	F	150	-	-	-	150	-
	TTL.	1703	63	1619 (3917)	222 (4077)	3607 (7994)	543

Table 5. Commercial catch-at-age for White Bay-Notre Dame Bay, 1966-83.

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	1.	86.	1.	1.	10.	1.	5.	1.	1.	2.
3	40.	43.	64.	54.	1.	303.	292.	728.	5.	128.
4	2.	1551.	1.	103.	13.	51.	2448.	1494.	119.	216.
5	27.	86.	718.	19.	24.	159.	362.	2928.	3177.	460.
6	67.	43.	11.	1155.	25.	57.	70.	775.	5523.	5458.
7	180.	1.	48.	1.	988.	431.	126.	734.	1198.	7090.
8	128.	86.	161.	108.	11.	10134.	408.	663.	705.	1123.
9	23.	1.	295.	9.	86.	235.	1391.	419.	1511.	836.
10	6.	1.	188.	59.	161.	278.	208.	1695.	861.	809.
11	75.	6.	1.	27.	167.	1139.	67.	162.	1595.	1072.
12	1.	80.	6.	1.	76.	1181.	275.	52.	152.	1986.
13	1.	1.	84.	1.	3.	537.	285.	214.	49.	189.
14	1.	1.	1.	12.	3.	21.	130.	222.	201.	61.
15	1.	1.	1.	1.	34.	21.	5.	101.	209.	250.
16	1.	1.	1.	1.	1.	240.	5.	4.	95.	260.
17	1.	1.	1.	1.	1.	1.	58.	4.	4.	118.
18	1.	1.	1.	1.	1.	1.	1.	45.	4.	5.
19	1.	1.	1.	1.	1.	1.	1.	1.	42.	5.
20	1.	1.	1.	1.	1.	1.	1.	1.	1.	52.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	121.	52.	1.	1.	115.	445.	76.	1.
3	32.	1704.	55.	53.	46.	152.	371.	43.
4	611.	109.	2041.	712.	1240.	41.	332.	51.
5	245.	468.	318.	869.	92.	1231.	59.	25.
6	815.	184.	1037.	647.	1080.	63.	268.	15.
7	10280.	795.	518.	1049.	17.	805.	34.	95.
8	16377.	7391.	2514.	2097.	496.	64.	258.	1.
9	1295.	12697.	10820.	6606.	179.	344.	19.	27.
10	3304.	1055.	11773.	14213.	1449.	194.	192.	4.
11	1391.	4488.	906.	11164.	5335.	982.	71.	37.
12	1843.	1890.	3854.	859.	4191.	3614.	359.	14.
13	3414.	2504.	1623.	3655.	322.	2839.	1312.	69.
14	325.	4638.	2150.	1539.	1372.	218.	1038.	254.
15	105.	441.	3983.	2039.	578.	929.	80.	201.
16	430.	143.	379.	3777.	765.	392.	340.	15.
17	447.	584.	123.	359.	1418.	518.	143.	66.
18	203.	607.	502.	117.	135.	961.	189.	28.
19	9.	276.	521.	476.	44.	91.	351.	37.
20	98.	145.	362.	837.	493.	364.	166.	100.

Table 6. Commercial catch-at-age for Bonavista Bay-Trinity Bay, 1966-83.

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	1.	35.	1.	1.	1.	1.	1.	1.	1.	1.
3	33.	17.	42.	6.	1.	416.	10.	2.	1.	396.
4	15.	628.	1.	4.	10.	226.	1354.	78.	2.	136.
5	9.	35.	469.	10.	10.	21.	390.	3632.	236.	164.
6	83.	17.	7.	332.	57.	18.	91.	380.	4848.	2577.
7	96.	1.	32.	4.	867.	200.	76.	63.	440.	14373.
8	179.	35.	105.	52.	37.	1042.	90.	80.	152.	456.
9	32.	1.	193.	27.	135.	129.	486.	107.	301.	1002.
10	40.	1.	123.	38.	74.	128.	14.	756.	69.	729.
11	300.	4.	2.	197.	26.	69.	68.	15.	581.	139.
12	1.	31.	7.	3.	135.	24.	37.	73.	12.	1170.
13	1.	1.	52.	11.	2.	125.	13.	40.	56.	24.
14	1.	1.	1.	83.	8.	2.	66.	14.	31.	113.
15	1.	1.	1.	1.	57.	7.	1.	71.	11.	62.
16	1.	1.	1.	1.	1.	53.	4.	1.	55.	22.
17	1.	1.	1.	1.	1.	1.	28.	4.	1.	111.
18	1.	1.	1.	1.	1.	1.	1.	30.	3.	2.
19	1.	1.	1.	1.	1.	1.	1.	1.	23.	6.
20	1.	1.	1.	1.	1.	1.	1.	1.	1.	46.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	14.	17.	22.	6.	15.	136.	1.	1.
3	77.	248.	26.	286.	13.	246.	8.	4.
4	495.	135.	358.	167.	195.	53.	11.	32.
5	122.	762.	115.	763.	43.	256.	2.	7.
6	167.	227.	242.	19.	294.	26.	30.	2.
7	4936.	50.	112.	433.	52.	288.	5.	15.
8	20812.	6202.	588.	101.	264.	23.	35.	1.
9	912.	23061.	4275.	530.	75.	321.	5.	8.
10	860.	952.	13035.	5565.	967.	88.	65.	2.
11	1303.	966.	790.	13898.	2680.	860.	9.	8.
12	248.	1463.	801.	841.	6693.	2383.	86.	1.
13	2092.	279.	1214.	853.	405.	5952.	239.	11.
14	43.	2349.	231.	1292.	411.	360.	596.	30.
15	202.	48.	1949.	246.	622.	366.	36.	76.
16	111.	227.	40.	2075.	118.	553.	37.	5.
17	39.	125.	188.	43.	999.	105.	55.	5.
18	198.	44.	104.	200.	21.	888.	11.	7.
19	4.	222.	37.	111.	96.	19.	89.	1.
20	93.	109.	275.	332.	213.	275.	29.	15.

Table 7. Commercial catch-at-age for Conception Bay-Southern Shore, 1966-83.

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	1.	4.	1.	1.	1.	1.	1.	68.	3.	13.
3	23.	2.	2.	13.	1.	10.	7.	1.	1.	424.
4	5.	67.	1.	3.	17.	31.	1625.	23.	5.	30.
5	1.	4.	17.	2.	20.	13.	135.	4525.	130.	16.
6	19.	2.	1.	65.	24.	8.	55.	264.	9544.	2055.
7	20.	1.	1.	2.	290.	41.	29.	469.	150.	8816.
8	125.	4.	4.	1.	14.	308.	79.	136.	75.	116.
9	28.	1.	7.	1.	15.	33.	359.	40.	40.	492.
10	1.	1.	5.	2.	12.	13.	67.	188.	13.	256.
11	126.	1.	1.	3.	14.	10.	22.	8.	584.	17.
12	1.	4.	1.	1.	20.	12.	17.	3.	25.	773.
13	1.	1.	1.	1.	7.	17.	21.	2.	9.	33.
14	1.	1.	1.	1.	7.	6.	29.	3.	6.	12.
15	1.	1.	1.	1.	7.	6.	10.	4.	9.	8.
16	1.	1.	1.	1.	1.	6.	10.	1.	12.	12.
17	1.	1.	1.	1.	1.	1.	10.	1.	3.	16.
18	1.	1.	1.	1.	1.	1.	1.	1.	3.	4.
19	1.	1.	1.	1.	1.	1.	1.	1.	3.	4.
20	1.	1.	1.	1.	1.	1.	1.	1.	1.	4.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	1046.	7.	1.	1.	1.	1.	1.	1.
3	15.	132.	1.	4.	1.	25.	2.	1.
4	85.	5.	99.	9.	3.	4.	5.	1.
5	22.	101.	32.	34.	1.	26.	1.	1.
6	28.	45.	65.	7.	19.	9.	2.	1.
7	2364.	13.	14.	38.	1.	28.	1.	1.
8	4779.	950.	3.	4.	12.	3.	5.	1.
9	73.	4260.	735.	31.	1.	14.	1.	1.
10	226.	49.	3084.	272.	49.	13.	1.	1.
11	157.	236.	65.	1144.	156.	21.	4.	1.
12	10.	164.	315.	24.	656.	68.	7.	1.
13	475.	10.	219.	117.	14.	288.	23.	1.
14	20.	496.	13.	81.	67.	6.	98.	2.
15	7.	21.	663.	5.	46.	29.	2.	7.
16	5.	7.	28.	246.	3.	20.	10.	1.
17	7.	5.	9.	10.	141.	1.	7.	1.
18	10.	7.	7.	3.	6.	62.	1.	1.
19	2.	10.	9.	3.	2.	3.	21.	1.
20	5.	7.	23.	12.	9.	5.	3.	2.

Table 8. Mean weight-at-age (g) of east coast Newfoundland herring from samples collected in all quarters, 1983.

Age	Area		
	A & B	C & D	E & F
2	111	131	137
3	231	224	222
4	256	258	266
5	298	304	281
6	313	332	330
7	330	350	356
8	356	370	370
9	358	384	390
10	349	381	400
11+	398	441	418

Table 9. Age specific selectivity pattern used in 1983 for east and southeast Newfoundland herring, as derived from Olsen (1959).

Age	Selectivity Factor
2	0.01
3	0.12
4	0.42
5	0.90
6	1.00
7	0.99
8	0.90
9	0.76
10	0.83
11	0.77
12	0.71
13	0.66
14	0.60
15	0.54
16	0.48
17	0.43
18	0.40
19	0.36
20	0.36

Table 10. Total catch (number of fish), number of days hauled and number of days fished for research gillnet program. (* indicate shallow gillnets.)

Area	Community	1980			1981			1982			1983		
		Total catch	# days hauled	# days fished	Total catch	# days hauled	# days fished	Total catch	# days hauled	# days fished	Total catch	# days hauled	# days fished
A & B	Westport	2162*	39	(54)	1031*	21	(36)	2354*	23	(29)	6988	25	(30)
	Brents Cove	-	-		-	-		19866	17	(28)	17410	11	(13)
	LaScie	6275*	18	(29)	4262	14	(24)	-	-		-	-	
	Harrys Hr.	-	-		2395	18	(29)	-	-		34127	25	(32)
	Leading Tickles	-	-		2849	13	(26)	-	-		10637	18	(28)
	Hillgrade	36168*	36	(58)	2749*	15	(33)	0*	17	(31)	285	24	(30)
C	Centreville	989*	33	(51)	829*	23	(30)	1369	18	(24)	1430	25	(29)
	Salvage	4216*	22	(32)	230*	24	(35)	10187	14	(24)	19639	19	(27)
	Portland	-	-		6734	16	(27)	3059	9	(30)	-	-	
	Charlottetown	-	-		-	-		-	-		8728	23	(35)
D	Port Rexton	-	-		-	-		1698	24	(30)	13435	23	(31)
	Hickmans Hr.	2413*	31	(48)	81*	26	(30)	154	25	(30)	-	-	
	Long Beach	-	-		-	-		-	-		695	18	(27)
E & F	Bay Roberts	-	-		-	-		-	-		2434	12	(29)

Table 11. Comparative catch rates of shallow vs deep research gillnets, where total days fished is the same for both type nets.

Area	Community		# caught per net 2"	2 1/4"	2 1/2"	2 3/4"	3"	Total # caught	Conversion factor
A	Westport	S	723	1027	1679	861	217	4507	1.55
		D	1020	1691	2945	1007	325	6988	
B	Hillgrade	S	15	22	12	9	1	59	4.83
		D	68	72	123	22	0	285	
C	Salvage	S	436	795	710	418	166	2525	7.78
		D	1755	4662	6745	4967	1510	19639	
A, B, C combined		S	1174	1844	2401	1288	384	7091	3.80
		D	2843	6425	9813	5996	1835	26912	

Table 12. CPUE indices (total number of herring caught per fishing days) from research gillnet program and calculation of instantaneous total mortality, Z. (* Catch rates adjusted by 3.80 where necessary to account for shallow nets.)

Area		Catch rates				f (fishing days)				Z3+			
		1980	1981	1982	1983	1980	1981	1982	1983	Z80-81	Z81-82	Z82-83	Z81-83
A & B	Westport	152*	109*	308*	233	54	36	29	30	0.48	-0.84	1.23	1.02
	Brents Cove	-	-	710	1339	-	-	28	13	-	-	-0.59	-
	LaScie	822*	178	-	-	29	24	-	-	1.55	-	-	-
	Harry's Hr.	-	83	-	1066	-	29	-	32	-	-	-	-
	Leading Tickles	-	110	-	380	-	26	-	28	-	-	-	-
	Hillgrade	2370*	317*	0*	10	58	33	31	30	2.14	9.17	-5.51	3.88
	Average (1)	1300	208	149	121	112	69	60	60	2.00	0.62	1.11	2.27
	(2)	1202	161	327	522	141	148	88	133	2.12	-0.62	-0.76	-0.86
C & D	Centreville	74*	105*	57	49	51	30	24	29	-0.27	0.89	0.12	1.07
	Salvage	501*	25*	424	727	32	35	24	27	2.93	-2.25	-0.49	-2.64
	Portland	-	249	102	-	-	27	30	-	-	1.50	-	-
	Charlottetown	-	-	-	249	-	-	-	35	-	-	-	-
	Port Rexton	-	-	57	433	-	-	30	31	-	-	-2.27	-
	Hickman's Hr.	191*	10*	5	-	48	30	30	-	2.82	0.74	-	-
	Long Beach	-	-	-	26	-	-	-	27	-	-	-	-
	Average (1)	238	62	241	376	83	65	48	56	1.29	0.20	-0.40	-1.07
	(2)	221	91	153	295	131	122	108	149	0.78	<0.01	-0.76	-0.75
E & F	Bay Roberts	-	-	-	84	-	-	-	29	-	-	-	-

1) weighted averages: only those communities consistent over four years

2) weighted averages: all communities

Table 13. CPUE indices (total number of herring caught per fishing days) from research gillnet program and calculation of instantaneous total mortality, Z. (* Catch rates adjusted by 1.55 (Area A), 4.83 (Area B), and 7.78 (Area C & D) where necessary to account for shallow nets.)

Area		Catch rates				f (fishing days)				Z3+			
		1980	1981	1982	1983	1980	1981	1982	1983	Z80-81	Z81-82	Z82-83	Z81-83
A & B	Westport	62*	44*	126*	233	54	36	29	30	0.48	-0.84	0.34	0.12
	Brents Cove	-	-	710	1339	-	-	28	13	-	-	-0.59	-
	LaScie	335*	178	-	-	29	24	-	-	0.66	-	-	-
	Harry's Hr.	-	83	-	1066	-	29	-	32	-	-	-	-
	Leading Tickles	-	110	-	380	-	26	-	28	-	-	-	-
	Hillgrade	3012*	402*	0*	10	58	33	31	30	2.14	9.41	-5.47	5.79
	Average (1)	1590	216	61	121	112	69	60	60	2.14	1.58	0.21	2.46
	(2)	1332	165	267	522	141	148	88	133	2.20	-0.43	-0.54	-0.82
C & D	Centreville	151*	215*	57	49	51	30	24	29	-0.18	1.69	0.12	1.87
	Salvage	1025*	51*	424	727	32	35	24	27	2.93	-1.54	-0.49	-1.92
	Portland	-	249	102	-	-	27	30	-	-	1.50	-	-
	Charlottetown	-	-	-	249	-	-	-	35	-	-	-	-
	Port Rexton	-	-	57	433	-	-	30	31	-	-	-2.27	-
	Hickman's Hr.	391*	21*	5	-	48	30	30	-	2.82	1.45	-	-
	Long Beach	-	-	-	26	-	-	-	27	-	-	-	-
	Average (1)	488	127	241	376	83	65	48	56	1.26	<0.01	-0.40	-0.29
	(2)	452	128	153	295	131	122	108	149	1.17	0.37	-0.76	-0.38
E & F	Bay Roberts	-	-	-	84	-	-	-	29	-	-	-	-

1) weighted averages: only those communities consistent over four years

2) weighted averages: all communities

Table 14. CPUE indices (total number of herring per days nets hauled) from research gillnet program and calculation of instantaneous total mortality, Z. (* Catch rates adjusted by 3.80 where necessary to account for shallow nets.)

Area		Catch rates				f (days hauled)				Z3+			
		1980	1981	1982	1983	1980	1981	1982	1983	Z80-81	Z81-82	Z82-83	Z81-83
A & B	Westport	211*	187*	389*	280	39	21	23	25	0.52	-0.53	1.28	1.37
	Brents Cove	-	-	1051	1583	-	-	17	11	-	-	-0.26	-
	LaScie	1325*	304	-	-	18	14	-	-	1.49	-	-	-
	Harry's Hr.	-	133	-	1365	-	18	-	25	-	-	-	-
	Leading Tickles	-	219	-	591	-	13	-	18	-	-	-	-
	Hillgrade	3818*	696*	0*	12	36	15	17	24	1.83	9.36	-5.14	4.44
	Average (1)	1942	399	224	148	75	36	40	60	1.76	0.87	1.51	2.92
	(2)	1823	295	505	674	93	81	57	133	1.95	-0.45	0.12	-0.26
C & D	Centreville	114*	137*	76	57	33	23	18	25	-0.10	0.87	0.26	1.19
	Salvage	728*	36*	728	1034	22	24	14	19	2.93	-2.41	-0.30	-2.61
	Portland	-	421	340	-	-	16	9	-	-	0.82	-	-
	Charlottetown	-	-	-	379	-	-	-	23	-	-	-	-
	Port Rexton	-	-	71	584	-	-	24	23	-	-	-2.34	-
	Hickman's Hr.	296*	12*	6	-	31	26	25	-	3.11	0.70	-	-
	Long Beach	-	-	-	39	-	-	-	18	-	-	-	-
	Average (1)	360	87	361	479	55	47	32	44	1.38	-0.87	-0.24	-0.99
	(2)	337	124	183	407	86	89	90	108	0.89	0.13	-0.90	-0.76
E & F	Bay Roberts	-	-	-	203	-	-	-	12	-	-	-	-

1) weighted averages: only those communities consistent over four years

2) weighted averages: all communities

Table 15. CPUE indices (total number of herring per days nets hauled) from research gillnet program and calculation of instantaneous total mortality, Z. (* Catch rates adjusted by 1.55 (Area A), 4.83 (Area B), and 7.78 (Area C & D) where necessary to account for shallow nets.)

Area		Catch rates				f (days hauled)				Z3+			
		1980	1981	1982	1983	1980	1981	1982	1983	Z80-81	Z81-82	Z82-83	Z81-83
A & B	Westport	86*	76*	159*	280	39	21	23	25	0.26	-0.53	0.39	0.47
	Brents Cove	-	-	1051	1583	-	-	17	11	-	-	-0.26	-
	LaScie	540*	304	-	-	18	14	-	-	0.59	-	-	-
	Harry's Hr.	-	133	-	1365	-	18	-	25	-	-	-	-
	Leading Tickles	-	219	-	591	-	13	-	18	-	-	-	-
	Hillgrade	4853*	885*	0*	12	36	15	17	24	1.83	9.59	-5.09	6.35
	Average (1)	2374	413	91	148	75	36	40	60	1.89	1.82	0.62	3.11
	(2)	2019	301	413	674	93	81	57	133	2.01	-0.26	-0.10	-0.22
C & D	Centreville	233*	280*	76	57	33	23	18	25	-0.02	1.67	0.26	1.99
	Salvage	1491*	75*	728	1034	22	24	14	19	2.93	-1.70	-0.30	-1.90
	Portland	-	421	340	-	-	16	9	-	-	0.82	-	-
	Charlottetown	-	-	-	379	-	-	-	23	-	-	-	-
	Port Rexton	-	-	71	584	-	-	24	23	-	-	-2.34	-
	Hickman's Hr.	606*	26*	6	-	31	26	25	-	3.11	1.41	-	-
	Long Beach	-	-	-	39	-	-	-	18	-	-	-	-
	Average (1)	736	175	361	479	55	47	32	44	1.35	-0.09	-0.24	-0.21
	(2)	689	175	183	407	86	89	90	108	1.27	0.50	-0.89	-0.38
E & F	Bay Roberts	-	-	-	203	-	-	-	12	-	-	-	-

1) weighted averages: only those communities consistent over four years

2) weighted averages: all communities

Table 16. Results of cohort analysis for White Bay-Notre Dame Bay using F_t = 0.028.

HERRING AREA A + B - FISHING MORTALITIES

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	.000	.001	.000	.000	.000	.000	.000	.000	.000	.001
3	.000	.000	.001	.000	.000	.001	.001	.010	.000	.007
4	.000	.003	.000	.001	.000	.001	.007	.005	.002	.019
5	.001	.003	.002	.000	.000	.001	.012	.010	.014	.009
6	.001	.002	.000	.004	.000	.001	.001	.031	.024	.030
7	.005	.000	.003	.000	.004	.005	.002	.008	.062	.039
8	.005	.003	.004	.007	.001	.050	.006	.015	.009	.076
9	.003	.000	.011	.000	.007	.019	.009	.007	.044	.014
10	.001	.000	.012	.003	.007	.029	.021	.013	.018	.030
11	.013	.001	.000	.002	.010	.060	.009	.021	.015	.028
12	.010	.017	.001	.000	.007	.086	.018	.008	.024	.023
13	.010	.012	.022	.000	.001	.066	.027	.018	.010	.038
14	.011	.012	.015	.004	.001	.008	.020	.026	.021	.015
15	.033	.013	.015	.019	.014	.009	.002	.020	.031	.032
16	.033	.042	.016	.019	.024	.126	.003	.002	.023	.049
17	.033	.042	.054	.020	.024	.030	.040	.003	.003	.036
18	.033	.042	.054	.070	.025	.030	.038	.040	.003	.005
19	.034	.042	.054	.070	.093	.032	.038	.048	.047	.005
20	.034	.042	.054	.070	.093	.126	.040	.048	.062	.076
F2+	.001	.002	.002	.002	.001	.010	.005	.010	.018	.029
F3+	.001	.002	.002	.002	.002	.014	.005	.010	.018	.029
F5+	.003	.002	.003	.003	.003	.025	.007	.012	.020	.030

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	.007	.031	.000	.001	.045	.062	.005	.000
3	.012	.128	.041	.005	.040	.077	.067	.003
4	.044	.049	.222	1.096	.140	.045	.240	.012
5	.027	.043	.199	.139	.377	.202	.085	.025
6	.021	.026	.125	.790	.256	.483	.061	.028
7	.071	.025	.094	.180	.039	.309	.527	.028
8	.120	.067	.104	.666	.121	.204	.153	.025
9	.118	.129	.133	.431	.104	.115	.086	.021
10	.068	.133	.170	.259	.156	.156	.087	.023
11	.066	.124	.162	.241	.145	.150	.079	.022
12	.062	.119	.149	.228	.133	.139	.075	.020
13	.051	.113	.143	.207	.124	.126	.068	.018
14	.086	.090	.134	.195	.111	.116	.062	.017
15	.032	.160	.104	.181	.104	.102	.057	.015
16	.072	.056	.201	.136	.096	.095	.049	.013
17	.112	.131	.062	.299	.069	.087	.046	.012
18	.080	.219	.159	.077	.174	.061	.041	.011
19	.010	.150	.297	.223	.038	.170	.028	.010
20	.120	.219	.297	1.096	.377	.483	.527	.010
F2+	.074	.095	.134	.228	.124	.120	.054	
F3+	.076	.095	.140	.230	.126	.124	.063	
F5+	.077	.094	.138	.240	.126	.125	.059	

Table 16 cont'd.

HERRING AREA A + B - POPULATION NUMBERS

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	265739.	161157.	284052.	62532.	575428.	470622.	100276.	18696.	23813.	3779.
3	638294.	217568.	131867.	232561.	51196.	471112.	385312.	82094.	15306.	19495.
4	36812.	522555.	178090.	107905.	190356.	41915.	385440.	315203.	66554.	12527.
5	29785.	30138.	426428.	145807.	88252.	155839.	34271.	313356.	256714.	54382.
6	59736.	24361.	24597.	348480.	119360.	72233.	127446.	27731.	253905.	207305.
7	44202.	48847.	19907.	20128.	284266.	97701.	59088.	104281.	22003.	202882.
8	26002.	36026.	39992.	16255.	16479.	231844.	79601.	48263.	84714.	16930.
9	7572.	21173.	29418.	32597.	13210.	13482.	180648.	64802.	38915.	68720.
10	7224.	6179.	17334.	23819.	26680.	10738.	10825.	146643.	52677.	30493.
11	6531.	5909.	5058.	14022.	19448.	21698.	8540.	8675.	118528.	42349.
12	110.	5280.	4832.	4140.	11456.	15771.	16734.	6931.	6956.	95599.
13	110.	90.	4250.	3951.	3389.	9310.	11844.	13452.	5628.	5557.
14	104.	89.	72.	3404.	3234.	2772.	7137.	9439.	10820.	4563.
15	34.	84.	72.	58.	2776.	2645.	2250.	5725.	7527.	8677.
16	34.	27.	68.	58.	47.	2242.	2147.	1838.	4596.	5974.
17	34.	27.	21.	55.	47.	37.	1618.	1753.	1501.	3677.
18	34.	27.	21.	16.	44.	37.	30.	1273.	1432.	1225.
19	34.	27.	21.	16.	12.	35.	30.	23.	1001.	1168.
20	33.	27.	21.	16.	12.	9.	28.	23.	18.	782.
B2+ (t)	160970.	194225.	219026.	214446.	246402.	277209.	282928.	273450.	247030.	209719.
B3+ (t)	139711.	181333.	196302.	209443.	200367.	239559.	274906.	271955.	245124.	209417.
B5+ (t)	47418.	47363.	142968.	156824.	155297.	168477.	146186.	197681.	229711.	204306.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	19306.	1895.	15672.	1583.	2898.	8171.	17358.	3941.
3	3092.	15697.	1505.	12830.	1295.	2269.	6288.	14143.
4	15846.	2503.	11310.	1182.	10457.	1019.	1720.	4812.
5	10061.	12421.	1950.	7413.	324.	7439.	797.	1108.
6	44108.	8015.	9746.	1309.	5283.	182.	4977.	599.
7	164789.	35375.	6396.	7041.	486.	3348.	92.	3832.
8	159691.	125616.	28244.	4768.	4815.	383.	2013.	44.
9	12845.	115925.	96158.	20849.	2006.	3494.	256.	1414.
10	55507.	9345.	83423.	68937.	11092.	1481.	2549.	192.
11	24234.	42455.	6697.	57648.	43580.	7771.	1037.	1913.
12	33702.	18582.	30699.	4663.	37097.	30853.	5473.	784.
13	76473.	25926.	13504.	21647.	3040.	26580.	21990.	4156.
14	4379.	59522.	18960.	9587.	14416.	2198.	19193.	16817.
15	3681.	3291.	44536.	13578.	6457.	10561.	1602.	14775.
16	6878.	2919.	2295.	32859.	9272.	4764.	7806.	1239.
17	4655.	5242.	2260.	1536.	23485.	6899.	3545.	6083.
18	2904.	3407.	3763.	1739.	933.	17945.	5180.	2773.
19	999.	2194.	2240.	2627.	1318.	642.	13822.	4070.
20	952.	810.	1546.	1363.	1720.	1039.	443.	10999.
B2+ (t)	174268.	136826.	105080.	80711.	56069.	43327.	33389.	32625.
B3+ (t)	172724.	136675.	103826.	80584.	55808.	42591.	31826.	32188.
B5+ (t)	169127.	134084.	101353.	79100.	53520.	42077.	30620.	27689.

Table 17. Results of cohort analysis for White Bay-Notre Dame Bay using F_t = 0.56.

HERRING AREA A + B - FISHING MORTALITIES

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	.000	.001	.000	.000	.000	.000	.000	.000	.000	.001
3	.000	.000	.001	.000	.000	.001	.001	.012	.000	.010
4	.000	.004	.000	.001	.000	.002	.009	.007	.002	.023
5	.001	.003	.003	.000	.000	.001	.014	.013	.017	.012
6	.001	.002	.001	.005	.000	.001	.001	.038	.030	.037
7	.005	.000	.003	.000	.005	.006	.003	.010	.075	.048
8	.006	.003	.005	.008	.001	.068	.007	.019	.012	.094
9	.003	.000	.011	.000	.008	.021	.012	.009	.056	.017
10	.001	.000	.012	.003	.007	.033	.024	.018	.024	.039
11	.015	.001	.000	.002	.010	.064	.010	.023	.021	.037
12	.012	.019	.002	.000	.008	.088	.020	.010	.027	.033
13	.012	.014	.026	.000	.001	.067	.028	.019	.011	.042
14	.012	.015	.018	.005	.001	.009	.021	.027	.022	.017
15	.037	.015	.018	.022	.016	.011	.003	.020	.032	.035
16	.037	.047	.019	.022	.028	.148	.003	.002	.024	.050
17	.037	.047	.061	.024	.028	.035	.048	.003	.003	.037
18	.037	.048	.061	.080	.030	.035	.045	.048	.004	.005
19	.038	.048	.061	.080	.107	.038	.045	.058	.058	.006
20	.038	.048	.061	.080	.107	.148	.048	.058	.075	.094
F2+	.001	.003	.002	.002	.002	.013	.006	.012	.022	.036
F3+	.001	.003	.003	.002	.003	.018	.006	.012	.023	.036
F5+	.003	.002	.004	.003	.004	.032	.009	.015	.025	.037

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	.008	.032	.000	.001	.069	.113	.010	.001
3	.013	.152	.043	.007	.070	.123	.130	.007
4	.058	.057	.274	1.185	.217	.082	.429	.024
5	.032	.057	.233	.179	.444	.349	.162	.050
6	.026	.031	.174	1.054	.354	.630	.118	.056
7	.091	.031	.113	.268	.062	.488	.864	.055
8	.150	.087	.131	.901	.195	.347	.283	.050
9	.149	.166	.178	.596	.165	.202	.163	.043
10	.088	.174	.229	.374	.246	.272	.165	.046
11	.086	.166	.222	.355	.233	.263	.150	.043
12	.083	.162	.210	.340	.217	.245	.144	.040
13	.072	.156	.203	.316	.205	.224	.131	.037
14	.095	.132	.194	.302	.187	.209	.119	.034
15	.037	.182	.161	.286	.177	.186	.110	.030
16	.077	.065	.234	.225	.164	.174	.096	.027
17	.115	.143	.074	.365	.123	.160	.089	.024
18	.083	.226	.176	.093	.226	.115	.080	.022
19	.010	.154	.308	.251	.046	.234	.056	.020
20	.150	.226	.308	1.185	.444	.630	.864	.020
F2+	.094	.123	.183	.337	.202	.213	.104	
F3+	.097	.124	.191	.339	.205	.220	.121	
F5+	.098	.123	.189	.354	.205	.223	.115	

Table 17 cont'd.

HERRING A + B - POPULATION NUMBERS

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	205064.	127323.	223313.	52407.	476693.	378686.	81687.	15826.	18086.	3309.
3	474307.	167891.	104166.	182833.	42906.	390274.	310041.	66875.	12956.	14807.
4	33601.	388293.	137419.	85226.	149642.	35128.	319256.	253576.	54094.	10603.
5	25991.	27509.	316504.	112508.	69684.	122505.	28714.	259169.	206258.	44181.
6	56222.	21255.	22444.	258482.	92097.	57031.	100154.	23182.	209540.	165995.
7	43421.	45970.	17363.	18366.	210582.	75380.	46641.	81936.	18278.	166560.
8	25460.	35387.	37636.	14172.	15036.	171516.	61326.	38072.	66420.	13881.
9	7386.	20729.	28895.	30668.	11506.	12300.	131256.	49840.	30571.	53742.
10	5911.	6027.	16971.	23390.	25101.	9342.	9858.	106205.	40426.	23662.
11	5678.	4834.	4933.	13724.	19097.	20405.	7397.	7883.	85419.	32319.
12	95.	4581.	3952.	4038.	11212.	15484.	15676.	5996.	6307.	68492.
13	95.	77.	3678.	3230.	3305.	9111.	11609.	12585.	4862.	5027.
14	89.	77.	62.	2936.	2644.	2703.	6974.	9247.	10110.	3936.
15	30.	72.	62.	50.	2393.	2162.	2194.	5592.	7370.	8096.
16	30.	24.	58.	50.	40.	1928.	1751.	1792.	4487.	5845.
17	30.	24.	19.	47.	40.	32.	1361.	1429.	1464.	3588.
18	30.	24.	19.	14.	37.	32.	25.	1062.	1166.	1195.
19	30.	24.	19.	14.	11.	30.	25.	20.	829.	951.
20	30.	24.	19.	14.	11.	8.	23.	20.	15.	641.
B2+ (t)	130795.	154832.	173099.	169449.	196404.	221997.	226728.	219352.	197470.	166959.
B3+ (t)	114390.	144647.	155234.	165256.	158269.	191702.	220193.	218086.	196023.	166694.
B5+ (t)	44553.	44270.	113759.	123809.	122484.	132735.	114788.	158223.	183427.	162594.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	16467.	1822.	10533.	925.	1901.	4602.	8735.	1971.
3	2707.	13373.	1445.	8623.	757.	1453.	3365.	7083.
4	12007.	2188.	9407.	1133.	7012.	578.	1052.	2420.
5	8486.	9277.	1692.	5855.	284.	4619.	436.	561.
6	35756.	6726.	7172.	1098.	4007.	149.	2668.	304.
7	130967.	28537.	5340.	4934.	313.	2304.	65.	1942.
8	129952.	97925.	22645.	3903.	3090.	241.	1158.	22.
9	10349.	91577.	73487.	16265.	1298.	2081.	140.	714.
10	43244.	7301.	63489.	50375.	7339.	901.	1393.	97.
11	18641.	32415.	5023.	41327.	28383.	4698.	562.	967.
12	25491.	14003.	22478.	3293.	23734.	18411.	2958.	396.
13	54280.	19202.	9755.	14917.	1919.	15640.	11804.	2097.
14	3944.	41351.	13456.	6518.	8905.	1279.	10236.	8477.
15	3167.	2935.	29659.	9071.	3944.	6050.	850.	7441.
16	6402.	2498.	2004.	20679.	5582.	2706.	4113.	624.
17	4550.	4853.	1916.	1298.	13513.	3878.	1861.	3059.
18	2830.	3321.	3444.	1457.	738.	9780.	2706.	1394.
19	974.	2134.	2169.	2366.	1087.	482.	7138.	2045.
20	774.	789.	1497.	1305.	1506.	850.	312.	5526.
B2+(t)	137803.	106069.	79055.	57703.	35850.	25497.	17775.	16421.
B3+(t)	136486.	105923.	78213.	57629.	35679.	25083.	16989.	16202.
B5+(t)	133713.	103705.	76130.	56570.	34162.	24769.	16317.	13947.

Table 19. Results of cohort analysis for Bonavista Bay-Trinity Bay using F_t = 0.028.

HERRING, AREAS C&D - FISHING MORTALITIES

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001
3	.000	.001	.001	.000	.000	.001	.000	.000	.000	.055
4	.002	.004	.000	.000	.000	.009	.004	.001	.000	.077
5	.000	.005	.004	.001	.000	.001	.019	.012	.003	.014
6	.005	.001	.001	.003	.006	.000	.004	.023	.020	.042
7	.008	.000	.002	.001	.010	.028	.002	.004	.033	.077
8	.009	.004	.009	.004	.009	.015	.016	.003	.011	.044
9	.007	.000	.026	.003	.013	.041	.009	.023	.015	.092
10	.008	.000	.010	.006	.010	.016	.006	.017	.018	.045
11	.072	.001	.001	.019	.005	.011	.010	.007	.016	.047
12	.006	.009	.002	.001	.016	.006	.007	.014	.007	.041
13	.008	.008	.020	.004	.001	.019	.004	.010	.013	.018
14	.008	.010	.010	.039	.004	.001	.012	.005	.009	.032
15	.013	.010	.012	.012	.034	.004	.001	.016	.005	.023
16	.014	.017	.012	.015	.015	.041	.003	.001	.016	.013
17	.020	.018	.021	.015	.019	.018	.027	.003	.001	.039
18	.020	.025	.022	.026	.019	.023	.023	.037	.003	.003
19	.020	.025	.031	.027	.032	.023	.029	.028	.035	.007
20	.072	.025	.031	.039	.034	.041	.029	.037	.035	.092
F2+	.003	.002	.003	.003	.002	.003	.004	.010	.015	.061
F3+	.003	.003	.004	.003	.006	.004	.004	.010	.016	.061
F5+	.009	.002	.005	.005	.008	.011	.009	.012	.016	.061

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	.003	.030	.008	.023	.018	.033	.001	.000
3	.081	.059	.058	.141	.063	.451	.002	.003
4	.090	.198	.113	.632	.134	.392	.032	.012
5	.092	.194	.258	.371	.324	.262	.022	.025
6	.018	.246	.087	.061	.238	.332	.044	.028
7	.105	.007	.184	.221	.238	.388	.097	.028
8	.152	.186	.102	.252	.203	.157	.073	.025
9	.116	.252	.189	.126	.301	.408	.046	.021
10	.107	.171	.220	.401	.355	.701	.133	.023
11	.107	.167	.210	.387	.343	.621	.136	.022
12	.111	.168	.204	.362	.326	.589	.111	.020
13	.097	.175	.205	.349	.296	.542	.103	.018
14	.040	.150	.215	.350	.282	.469	.092	.017
15	.075	.057	.180	.374	.283	.437	.076	.015
16	.052	.113	.062	.296	.309	.439	.070	.013
17	.028	.076	.129	.088	.226	.500	.069	.012
18	.092	.040	.084	.197	.056	.322	.087	.011
19	.007	.141	.042	.121	.136	.066	.048	.010
20	.152	.252	.258	.632	.355	.701	.136	.010
F2+	.122	.200	.189	.343	.293	.426	.065	
F3+	.124	.200	.193	.345	.298	.490	.069	
F5+	.125	.204	.196	.349	.305	.491	.085	

Table 18 cont'd.

HERRING, AREAS C&D - POPULATION NUMBERS

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	22256.	92070.	52127.	42293.	605701.	155821.	23157.	3030.	10048.	1345.
3	208613.	18220.	75349.	42677.	34626.	495905.	127575.	18958.	2480.	8226.
4	9839.	170768.	14902.	61653.	34936.	28348.	405636.	104440.	15520.	2029.
5	25425.	8042.	139245.	12200.	50473.	28594.	23005.	330882.	85438.	12705.
6	19547.	20808.	6553.	113580.	9980.	41315.	23392.	18482.	267617.	69737.
7	12634.	15928.	17021.	5359.	92691.	8119.	33810.	19069.	14788.	214719.
8	21565.	10257.	13040.	13907.	4384.	75104.	6466.	27612.	15555.	11709.
9	4970.	17494.	8366.	10581.	11339.	3556.	60547.	5213.	22535.	12598.
10	5566.	4040.	14322.	6675.	8639.	9161.	2794.	49132.	4171.	18177.
11	4776.	4521.	3307.	11615.	5430.	7006.	7385.	2275.	39542.	3352.
12	176.	3639.	3698.	2706.	9331.	4423.	5674.	5985.	1849.	31849.
13	140.	144.	2951.	3021.	2213.	7517.	3599.	4612.	4834.	1503.
14	140.	114.	117.	2369.	2463.	1810.	6042.	2935.	3739.	3907.
15	83.	113.	92.	95.	1865.	2010.	1480.	4887.	2390.	3034.
16	79.	67.	92.	75.	77.	1475.	1639.	1211.	3937.	1947.
17	56.	64.	54.	74.	60.	62.	1160.	1338.	990.	3173.
18	56.	45.	51.	43.	60.	48.	50.	924.	1092.	810.
19	56.	45.	36.	41.	35.	48.	39.	40.	730.	891.
20	16.	45.	36.	28.	33.	27.	39.	31.	32.	577.
2+ (t)	58655.	68519.	72669.	71323.	114765.	140202.	152674.	148951.	130515.	109680.
3+ (t)	56875.	61153.	68498.	67940.	66308.	127737.	150821.	148708.	129711.	109572.
5+ (t)	25652.	23595.	54895.	49326.	54299.	52499.	49805.	124644.	126183.	108005.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	5893.	642.	2966.	293.	932.	4665.	1608.	3941.
3	1100.	4812.	510.	2408.	235.	750.	3697.	1316.
4	6376.	831.	3716.	394.	1713.	180.	391.	3019.
5	1538.	4773.	558.	2718.	172.	1226.	100.	310.
6	10253.	1149.	3218.	353.	1535.	102.	772.	80.
7	54764.	8244.	735.	2416.	272.	991.	60.	605.
8	162792.	40371.	6704.	501.	1586.	175.	551.	44.
9	9174.	114452.	27441.	4957.	319.	1060.	123.	419.
10	9408.	6686.	72839.	18599.	3579.	193.	577.	96.
11	14223.	6924.	4613.	47841.	10192.	2055.	78.	414.
12	2619.	10466.	4795.	3062.	26593.	5919.	904.	56.
13	25017.	1920.	7245.	3201.	1746.	15717.	2690.	663.
14	1209.	18589.	1319.	4833.	1849.	1063.	7482.	1986.
15	3096.	951.	13094.	871.	2788.	1142.	544.	5586.
16	2428.	2352.	735.	8957.	491.	1720.	604.	413.
17	1574.	1887.	1721.	566.	5456.	295.	908.	461.
18	2498.	1254.	1432.	1239.	424.	3563.	147.	693.
19	661.	1866.	987.	1078.	833.	328.	2114.	110.
20	724.	538.	1327.	774.	782.	595.	252.	1650.
2+ (t)	87752.	65918.	45940.	33931.	20585.	13557.	7300.	7443.
3+ (t)	87280.	65867.	45703.	33911.	20515.	13207.	7180.	6926.
5+ (t)	85819.	65023.	44869.	33507.	20121.	13039.	6470.	5853.

Table 19. Results of cohort analysis for Bonavista Bay-Trinity Bay using F_t = 0.056.

HERRING, AREAS C&D - FISHING MORTALITIES

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001
3	.000	.001	.001	.000	.000	.001	.000	.000	.000	.063
4	.002	.005	.000	.000	.000	.010	.004	.001	.000	.083
5	.000	.007	.004	.001	.000	.001	.021	.013	.003	.016
6	.005	.001	.002	.004	.007	.001	.005	.025	.022	.045
7	.009	.000	.002	.001	.012	.030	.003	.004	.037	.082
8	.011	.004	.010	.005	.013	.018	.017	.004	.012	.048
9	.008	.000	.029	.003	.015	.057	.010	.025	.016	.102
10	.009	.000	.011	.007	.011	.017	.008	.020	.020	.050
11	.077	.001	.001	.023	.006	.012	.011	.010	.019	.051
12	.007	.010	.002	.001	.019	.007	.008	.015	.010	.048
13	.009	.008	.021	.004	.001	.022	.004	.011	.014	.025
14	.009	.011	.010	.043	.004	.001	.015	.006	.010	.037
15	.018	.011	.013	.013	.037	.004	.001	.020	.006	.026
16	.018	.022	.013	.016	.016	.044	.003	.001	.019	.014
17	.021	.022	.028	.016	.020	.020	.029	.004	.001	.048
18	.021	.027	.028	.035	.020	.025	.025	.040	.003	.003
19	.021	.027	.034	.035	.045	.025	.032	.031	.039	.008
20	.077	.027	.034	.043	.045	.057	.032	.040	.039	.102
F2+	.003	.003	.004	.003	.002	.003	.004	.011	.017	.066
F3+	.003	.004	.004	.003	.007	.004	.005	.011	.017	.067
F5+	.010	.002	.006	.005	.009	.012	.010	.013	.018	.067

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	.003	.034	.011	.033	.026	.064	.001	.001
3	.098	.069	.066	.200	.092	.738	.005	.007
4	.104	.251	.134	.764	.204	.657	.061	.024
5	.099	.230	.351	.468	.447	.450	.044	.050
6	.021	.271	.106	.089	.330	.539	.085	.056
7	.114	.008	.208	.280	.371	.630	.184	.055
8	.165	.204	.119	.293	.275	.278	.139	.050
9	.129	.277	.212	.149	.370	.635	.089	.043
10	.119	.193	.249	.470	.444	1.026	.248	.046
11	.119	.190	.242	.460	.435	.935	.253	.043
12	.121	.191	.238	.441	.421	.896	.209	.040
13	.113	.195	.239	.431	.395	.839	.196	.037
14	.058	.179	.246	.433	.382	.746	.175	.034
15	.085	.085	.221	.451	.383	.704	.146	.030
16	.059	.130	.094	.388	.406	.707	.135	.027
17	.031	.088	.151	.139	.327	.785	.133	.024
18	.114	.045	.098	.238	.093	.544	.166	.022
19	.007	.180	.048	.144	.171	.114	.093	.020
20	.165	.277	.351	.764	.447	1.026	.253	.020
F2+	.134	.224	.218	.416	.387	.688	.124	
F3+	.136	.224	.222	.417	.393	.771	.133	
F5+	.137	.228	.225	.421	.399	.773	.162	

Table 19 cont'd.

HERRING, AREAS C&D - POPULATION NUMBERS

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	20616.	83612.	47525.	38918.	568368.	144963.	20193.	2825.	8810.	1109.
3	184015.	16878.	68424.	38910.	31863.	465340.	118684.	16532.	2312.	7212.
4	7164.	150629.	13803.	55983.	31851.	26086.	380612.	97161.	13534.	1892.
5	22813.	5852.	122756.	11300.	45831.	26068.	21153.	310393.	79479.	11078.
6	17315.	18669.	4759.	100080.	9243.	37514.	21324.	16966.	250842.	64858.
7	11326.	14101.	15270.	3890.	81638.	7516.	30698.	17376.	13546.	200986.
8	18167.	9186.	11544.	12473.	3181.	66055.	5972.	25065.	14169.	10693.
9	4578.	14712.	7489.	9356.	10165.	2571.	53139.	4808.	20449.	11463.
10	5195.	3719.	12044.	5957.	7636.	8200.	1988.	43066.	3840.	16470.
11	4462.	4217.	3044.	9749.	4843.	6185.	6598.	1615.	34576.	3081.
12	163.	3382.	3449.	2491.	7804.	3941.	5001.	5340.	1309.	27782.
13	129.	132.	2741.	2818.	2036.	6267.	3205.	4061.	4306.	1061.
14	129.	105.	108.	2197.	2297.	1665.	5018.	2612.	3289.	3475.
15	63.	105.	85.	87.	1723.	1873.	1362.	4049.	2126.	2665.
16	62.	50.	85.	69.	70.	1359.	1527.	1114.	3251.	1731.
17	52.	50.	40.	69.	55.	57.	1065.	1247.	911.	2612.
18	52.	42.	40.	32.	55.	44.	46.	847.	1017.	745.
19	52.	42.	33.	32.	25.	44.	35.	36.	666.	830.
20	15.	42.	33.	26.	25.	20.	35.	28.	29.	525.
B2+ (t)	51664.	60542.	64441.	63470.	104599.	128776.	140668.	137405.	120192.	100846.
B3+ (t)	50014.	53853.	60639.	60356.	59130.	117179.	139053.	137179.	119488.	100757.
B5+ (t)	22784.	20611.	48230.	43433.	48139.	46683.	44412.	114947.	116390.	99360.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	5052.	569.	2155.	206.	653.	2426.	806.	1971.
3	907.	4124.	451.	1744.	163.	521.	1863.	659.
4	5546.	673.	3152.	345.	1169.	122.	204.	1518.
5	1426.	4093.	429.	2257.	132.	781.	52.	157.
6	8922.	1057.	2662.	247.	1157.	69.	408.	40.
7	50769.	7154.	660.	1960.	185.	681.	33.	307.
8	151548.	37100.	5812.	439.	1213.	105.	297.	22.
9	8342.	105245.	24763.	4226.	268.	754.	65.	212.
10	8479.	6005.	65301.	16406.	2980.	152.	327.	49.
11	12825.	6164.	4055.	41670.	8397.	1565.	44.	209.
12	2397.	9321.	4172.	2605.	21541.	4450.	503.	28.
13	21688.	1738.	6308.	2691.	1372.	11580.	1487.	334.
14	847.	15863.	1171.	4066.	1432.	757.	4095.	1001.
15	2743.	654.	10862.	749.	2160.	800.	294.	2814.
16	2125.	2063.	492.	7130.	391.	1205.	324.	208.
17	1397.	1640.	1484.	367.	3960.	213.	486.	232.
18	2038.	1109.	1229.	1045.	261.	2338.	80.	349.
19	608.	1489.	868.	912.	674.	195.	1111.	55.
20	674.	494.	1018.	677.	647.	465.	143.	829.
B2+ (t)	80205.	59495.	40438	29056.	16375.	9728.	3943.	3746.
B3+ (t)	79801.	59450.	40265.	29042.	16326.	9546.	3883.	3488.
B5+ (t)	78537.	58734.	39556.	28736.	16057.	9429.	3524.	2949.

Table 20. Results of cohort analysis for Conception Bay-Southern Shore using F_t = 0.028.

HERRING, AREAS E&F - FISHING MORTALITIES

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	.000	.000	.000	.000	.000	.000	.001	.092	.002	.038
3	.001	.001	.000	.001	.000	.000	.000	.001	.002	.438
4	.002	.002	.000	.000	.002	.011	.019	.002	.006	.066
5	.001	.002	.001	.001	.004	.002	.061	.069	.011	.025
6	.022	.003	.001	.003	.013	.002	.010	.162	.204	.240
7	.020	.001	.002	.002	.016	.027	.008	.108	.130	.294
8	.104	.005	.007	.002	.015	.022	.067	.045	.023	.140
9	.083	.001	.011	.002	.039	.044	.032	.044	.017	.202
10	.006	.004	.007	.004	.032	.043	.117	.021	.018	.142
11	.581	.007	.005	.005	.032	.034	.095	.018	.083	.029
12	.023	.031	.009	.006	.040	.035	.074	.017	.073	.151
13	.025	.028	.010	.011	.050	.043	.079	.011	.064	.130
14	.046	.031	.036	.012	.097	.055	.097	.014	.042	.113
15	.046	.059	.039	.046	.108	.113	.123	.017	.055	.072
16	.046	.059	.077	.050	.059	.128	.278	.016	.066	.096
17	.046	.059	.077	.103	.065	.077	.325	.040	.061	.118
18	.046	.059	.077	.103	.142	.086	.102	.048	.161	.108
19	.046	.060	.078	.104	.142	.206	.116	.141	.198	.336
20	.581	.060	.078	.104	.142	.206	.325	.162	.204	.438
F2+	.007	.002	.001	.002	.003	.003	.019	.056	.137	.249
F3+	.008	.002	.001	.002	.011	.004	.019	.056	.140	.251
F5+	.067	.004	.001	.003	.015	.016	.033	.066	.142	.249

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	.916	.040	.006	.011	.009	.008	.003	.000
3	.057	.263	.007	.031	.014	.321	.019	.003
4	.144	.024	.322	.082	.029	.070	.097	.012
5	.063	.255	.212	.173	.012	.376	.022	.025
6	.056	.177	.260	.065	.138	.138	.044	.028
7	.479	.033	.076	.238	.012	.311	.020	.028
8	.256	.359	.010	.028	.109	.044	.083	.025
9	.123	.383	.525	.129	.009	.180	.019	.021
10	.134	.113	.533	.374	.309	.150	.017	.023
11	.121	.203	.217	.384	.382	.210	.063	.022
12	.022	.180	.456	.115	.397	.284	.100	.020
13	.131	.027	.387	.304	.091	.303	.146	.018
14	.108	.196	.045	.240	.286	.051	.159	.017
15	.089	.159	.436	.022	.209	.192	.022	.015
16	.059	.121	.329	.285	.016	.132	.094	.013
17	.075	.077	.226	.186	.262	.007	.062	.012
18	.101	.100	.147	.109	.163	.176	.008	.011
19	.072	.138	.180	.086	.099	.114	.083	.010
20	.916	.383	.533	.384	.397	.376	.159	.010
F2+	.269	.303	.435	.289	.266	.210	.079	
F3+	.247	.305	.441	.293	.272	.219	.093	
F5+	.250	.309	.450	.301	.283	.219	.096	

Table 20 cont'd.

HERRING, AREAS E&F - POPULATION NUMBERS

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	4659.	11432.	13932.	4678.	139274.	24023.	1310.	854.	1618.	381.
3	44101.	3814.	9356.	11406.	3829.	114027.	19667.	1072.	638.	1322.
4	2379.	36086.	3121.	7658.	9327.	3134.	93348.	16096.	877.	521.
5	976.	1943.	29484.	2554.	6267.	7621.	2538.	74957.	13157.	713.
6	964.	798.	1587.	24124.	2089.	5113.	6227.	1956.	57275.	10655.
7	1126.	772.	652.	1299.	19693.	1689.	4179.	5049.	1362.	38257.
8	1404.	904.	631.	533.	1061.	15861.	1346.	3395.	3709.	980.
9	389.	1036.	736.	513.	435.	856.	12707.	1030.	2657.	2969.
10	193.	294.	848.	597.	419.	343.	671.	10079.	807.	2139.
11	316.	157.	239.	689.	487.	332.	269.	489.	8082.	649.
12	49.	145.	127.	195.	562.	386.	263.	200.	393.	6088.
13	45.	39.	115.	103.	159.	442.	305.	200.	161.	299.
14	25.	36.	31.	93.	84.	124.	346.	231.	162.	124.
15	25.	19.	29.	25.	75.	62.	96.	257.	186.	127.
16	25.	19.	15.	23.	19.	55.	46.	69.	207.	144.
17	25.	19.	15.	11.	18.	15.	40.	28.	56.	159.
18	24.	19.	15.	11.	8.	13.	11.	24.	22.	43.
19	24.	19.	15.	11.	8.	6.	10.	8.	18.	15.
20	2.	19.	15.	11.	8.	6.	4.	7.	6.	12.
B2+ (t)	10086.	11899.	12770.	12769.	23079.	31570.	34112.	31059.	25664.	19355.
B3+ (t)	9714.	10985.	11656.	12395.	11937.	29648.	34007.	30991.	25534.	19324.
B5+ (t)	1655.	1820.	9329.	8649.	9085.	9524.	8634.	27010.	25219.	18976.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	1928.	198.	178.	100.	124.	145.	403.	3941.
3	300.	632.	156.	145.	81.	100.	117.	329.
4	699.	232.	398.	127.	115.	65.	60.	94.
5	400.	495.	185.	236.	96.	92.	50.	44.
6	569.	307.	314.	123.	162.	77.	51.	40.
7	6864.	441.	211.	198.	94.	116.	55.	40.
8	23345.	3481.	349.	160.	128.	76.	70.	44.
9	697.	14789.	1990.	283.	127.	94.	60.	52.
10	1986.	505.	8254.	964.	204.	103.	64.	48.
11	1520.	1421.	369.	3967.	543.	123.	73.	52.
12	516.	1102.	950.	243.	2213.	304.	81.	56.
13	4285.	414.	754.	493.	177.	1218.	187.	60.
14	215.	3079.	330.	419.	298.	133.	737.	132.
15	90.	158.	2072.	258.	270.	183.	103.	515.
16	97.	68.	110.	1096.	207.	179.	124.	83.
17	107.	75.	49.	65.	675.	167.	129.	92.
18	115.	81.	57.	32.	44.	425.	135.	99.
19	32.	85.	60.	40.	24.	31.	292.	110.
20	9.	24.	61.	41.	30.	17.	22.	220.
B2+ (t)	12964.	8612.	5516.	3212.	2011.	1279.	897.	1327.
B3+ (t)	12810.	8597.	5501.	3203.	1999.	1265.	859.	787.
B5+ (t)	12594.	8434.	5381.	3153.	1960.	1236.	829.	689.

Table 21. Results of cohort analysis for Conception Bay-Southern Shore using F_t = 0.056.

HERRING, AREAS E&F - FISHING MORTALITIES

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	.000	.000	.000	.000	.000	.000	.001	.123	.002	.056
3	.001	.001	.000	.001	.000	.000	.000	.001	.002	.498
4	.003	.002	.001	.000	.002	.013	.020	.002	.008	.090
5	.001	.003	.001	.001	.004	.002	.071	.071	.011	.032
6	.025	.003	.001	.003	.020	.002	.011	.194	.210	.248
7	.021	.002	.002	.002	.018	.043	.009	.117	.161	.306
8	.108	.005	.008	.002	.016	.024	.108	.051	.024	.180
9	.086	.001	.011	.002	.044	.049	.034	.073	.019	.221
10	.006	.004	.007	.004	.036	.049	.132	.023	.031	.162
11	.600	.007	.005	.005	.035	.038	.110	.021	.091	.051
12	.024	.032	.009	.006	.042	.038	.085	.019	.083	.167
13	.028	.029	.010	.011	.052	.046	.086	.013	.075	.151
14	.047	.035	.037	.012	.099	.057	.102	.016	.048	.135
15	.047	.061	.044	.047	.114	.115	.128	.018	.060	.084
16	.047	.061	.080	.057	.061	.135	.286	.017	.070	.107
17	.048	.061	.080	.107	.074	.080	.347	.041	.064	.126
18	.048	.061	.080	.107	.148	.099	.108	.052	.168	.114
19	.048	.062	.080	.108	.149	.217	.136	.149	.218	.353
20	.600	.062	.080	.108	.149	.217	.347	.194	.218	.498
F2+	.008	.002	.001	.002	.003	.003	.020	.059	.145	.266
F3+	.008	.003	.001	.002	.012	.004	.020	.059	.147	.267
F5+	.072	.005	.002	.003	.017	.018	.036	.069	.150	.265

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	1.006	.064	.009	.020	.013	.015	.005	.001
3	.085	.311	.012	.045	.025	.523	.037	.007
4	.172	.037	.407	.136	.043	.131	.184	.024
5	.088	.317	.346	.237	.020	.624	.044	.050
6	.072	.263	.348	.117	.201	.251	.085	.056
7	.504	.043	.121	.352	.022	.512	.040	.055
8	.270	.388	.012	.046	.178	.085	.158	.050
9	.165	.412	.595	.172	.014	.325	.037	.043
10	.149	.159	.599	.458	.450	.264	.034	.046
11	.141	.230	.327	.465	.522	.353	.120	.043
12	.038	.215	.548	.192	.536	.454	.189	.040
13	.147	.049	.495	.402	.163	.478	.271	.037
14	.128	.226	.083	.341	.424	.098	.294	.034
15	.109	.193	.533	.041	.332	.328	.043	.030
16	.069	.151	.426	.384	.031	.234	.178	.027
17	.084	.092	.297	.264	.397	.013	.120	.024
18	.108	.113	.179	.152	.250	.304	.016	.022
19	.077	.150	.207	.108	.143	.191	.159	.020
20	1.006	.412	.599	.465	.536	.624	.294	.020
F2+	.293	.341	.522	.380	.390	.354	.151	
F3+	.269	.343	.528	.384	.400	.368	.176	
F5+	.272	.346	.535	.393	.414	.368	.183	

Table 21 cont'd.

HERRING, AREAS E&F - POPULATION NUMBERS

AGE/YEAR	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
2	3020.	10224.	13012.	4003.	135836.	23299.	1041.	649.	1464.	263.
3	40822.	2471.	8367.	10653.	3277.	111212.	19075.	851.	470.	1196.
4	2145.	33401.	2022.	6848.	8710.	2682.	91044.	15611.	696.	384.
5	861.	1751.	27286.	1654.	5604.	7116.	2168.	73070.	12760.	565.
6	859.	704.	1430.	22324.	1353.	4570.	5814.	1653.	55730.	10329.
7	1046.	686.	575.	1170.	18219.	1086.	3735.	4710.	1114.	36992.
8	1347.	838.	561.	470.	956.	14654.	852.	3031.	3432.	776.
9	377.	990.	683.	456.	384.	770.	11719.	626.	2359.	2742.
10	189.	283.	809.	552.	372.	300.	601.	9270.	476.	1895.
11	309.	154.	231.	658.	451.	294.	234.	431.	7419.	378.
12	48.	139.	125.	188.	536.	356.	231.	172.	346.	5546.
13	41.	38.	110.	101.	153.	421.	281.	174.	138.	260.
14	24.	32.	30.	89.	82.	119.	329.	211.	141.	105.
15	24.	19.	26.	24.	72.	61.	92.	243.	170.	110.
16	24.	19.	14.	20.	19.	53.	44.	66.	196.	131.
17	24.	19.	14.	11.	15.	14.	38.	27.	53.	149.
18	24.	19.	14.	11.	8.	12.	11.	22.	21.	41.
19	24.	19.	14.	11.	8.	6.	9.	8.	17.	15.
20	2.	18.	14.	11.	8.	6.	4.	6.	6.	11.
B2+ (t)	9231.	10795.	11565.	11555.	21665.	30032.	32589.	29655.	24409.	18252.
B3+ (t)	8990.	9978.	10524.	11235.	10798.	28168.	32505.	29603.	24292.	18231.
B5+ (t)	1544.	1675.	8624.	7808.	8186.	8629.	7777.	25774.	24048.	17937.

AGE/YEAR	1976	1977	1978	1979	1980	1981	1982	1983
2	1822.	126.	124.	56.	84.	75.	202.	1971.
3	204.	546.	96.	101.	45.	68.	60.	165.
4	595.	153.	327.	78.	79.	36.	33.	47.
5	287.	410.	121.	178.	56.	62.	26.	22.
6	448.	215.	245.	70.	115.	45.	27.	20.
7	6598.	342.	135.	141.	51.	77.	28.	20.
8	22310.	3263.	268.	98.	81.	41.	38.	22.
9	531.	13941.	1812.	217.	77.	56.	31.	26.
10	1800.	368.	7560.	818.	149.	62.	33.	24.
11	1320.	1269.	257.	3399.	424.	78.	39.	26.
12	294.	939.	826.	152.	1748.	206.	45.	28.
13	3841.	232.	620.	391.	103.	837.	107.	30.
14	183.	2715.	181.	309.	214.	71.	425.	67.
15	75.	132.	1774.	136.	180.	115.	53.	259.
16	83.	55.	89.	853.	107.	106.	68.	42.
17	96.	63.	39.	48.	476.	85.	69.	46.
18	108.	73.	47.	24.	30.	262.	69.	50.
19	30.	79.	53.	32.	17.	19.	158.	55.
20	9.	23.	56.	35.	24.	12.	13.	111.
B2+ (t)	12012.	7792.	4804.	2564.	1463.	815.	491.	666.
B3+ (t)	11866.	7782.	4794.	2559.	1455.	808.	472.	396.
B5+ (t)	11691.	7653.	4700.	2527.	1430.	791.	456.	347.

Table 22. Multiple regression, environmental model, used to predict year-class strength for east coast Newfoundland herring.

East coast Newfoundland herring; all stocks combined

Temp.	Sal.	Log_eR
9.090	31.940	6.560
4.840	31.970	5.210
4.040	31.940	5.200
7.430	32.020	5.510
6.000	31.830	4.490
11.400	31.880	7.020
9.130	31.830	6.220
9.910	31.470	4.580
7.100	31.570	2.940
3.450	31.850	3.270
.010	31.660	1.670
3.390	31.670	3.210
3.070	31.830	.990
4.250	31.950	2.510

	Regression	Residual	Corrected total
Degrees of freedom	2.	11.	13.
Sums of squares	33.577	10.960	44.537
Mean square	16.789	.996	

F value 16.851
Tail area of F distr. .000
R squared
St. Dev. of residuals
Residual St. Dev./Response mean

Variable number	Mean	Regression coefficient	Lower confidence limit	Upper confidence limit
1	5.9364	.4534	.2980	.6089
2	31.8150	4.2817	1.2331	7.3304
3	4.2414	-134.6738	-231.6772	-37.6704

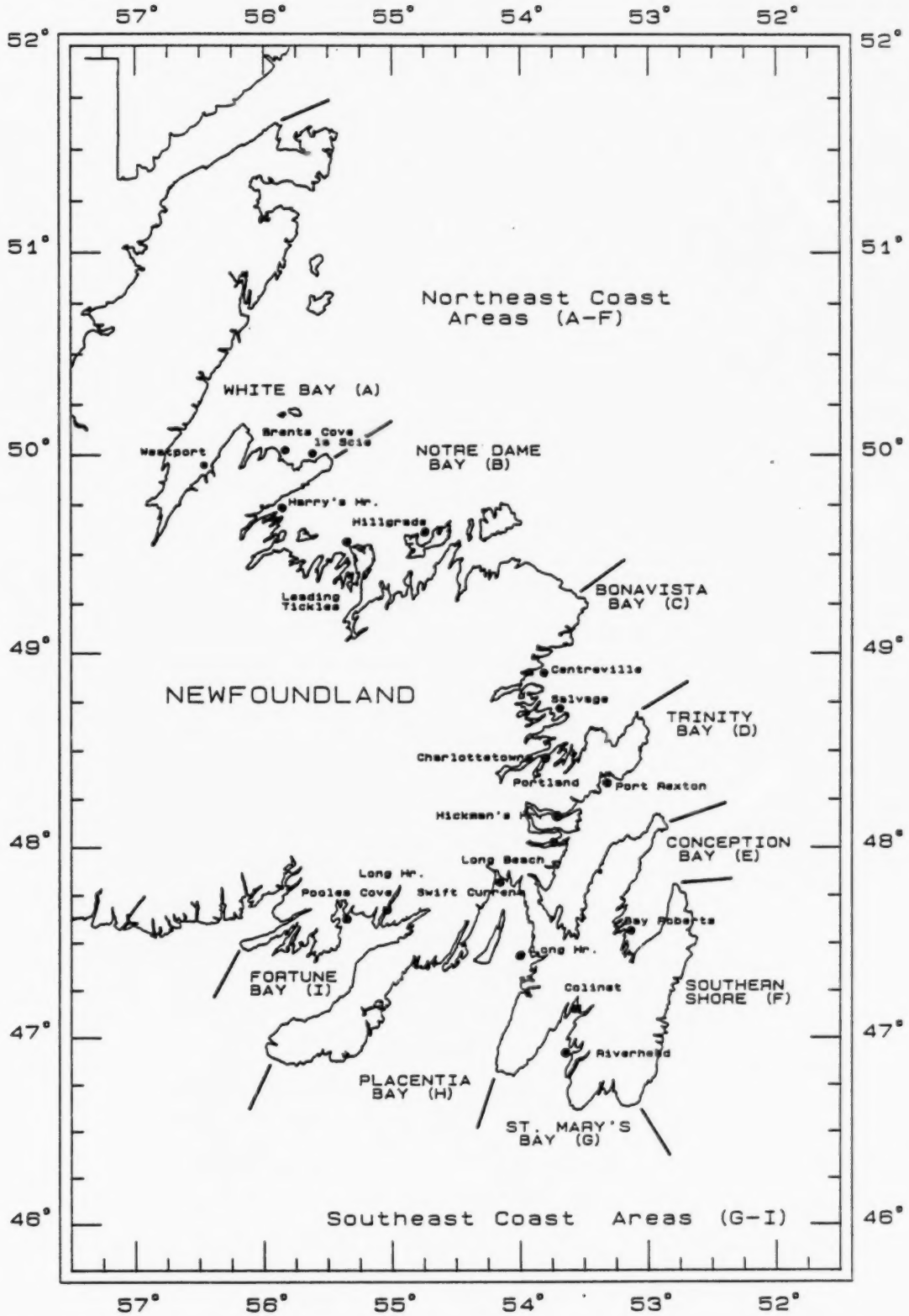

Fig.1. Area map indicating stock areas and research gillnet community locations.

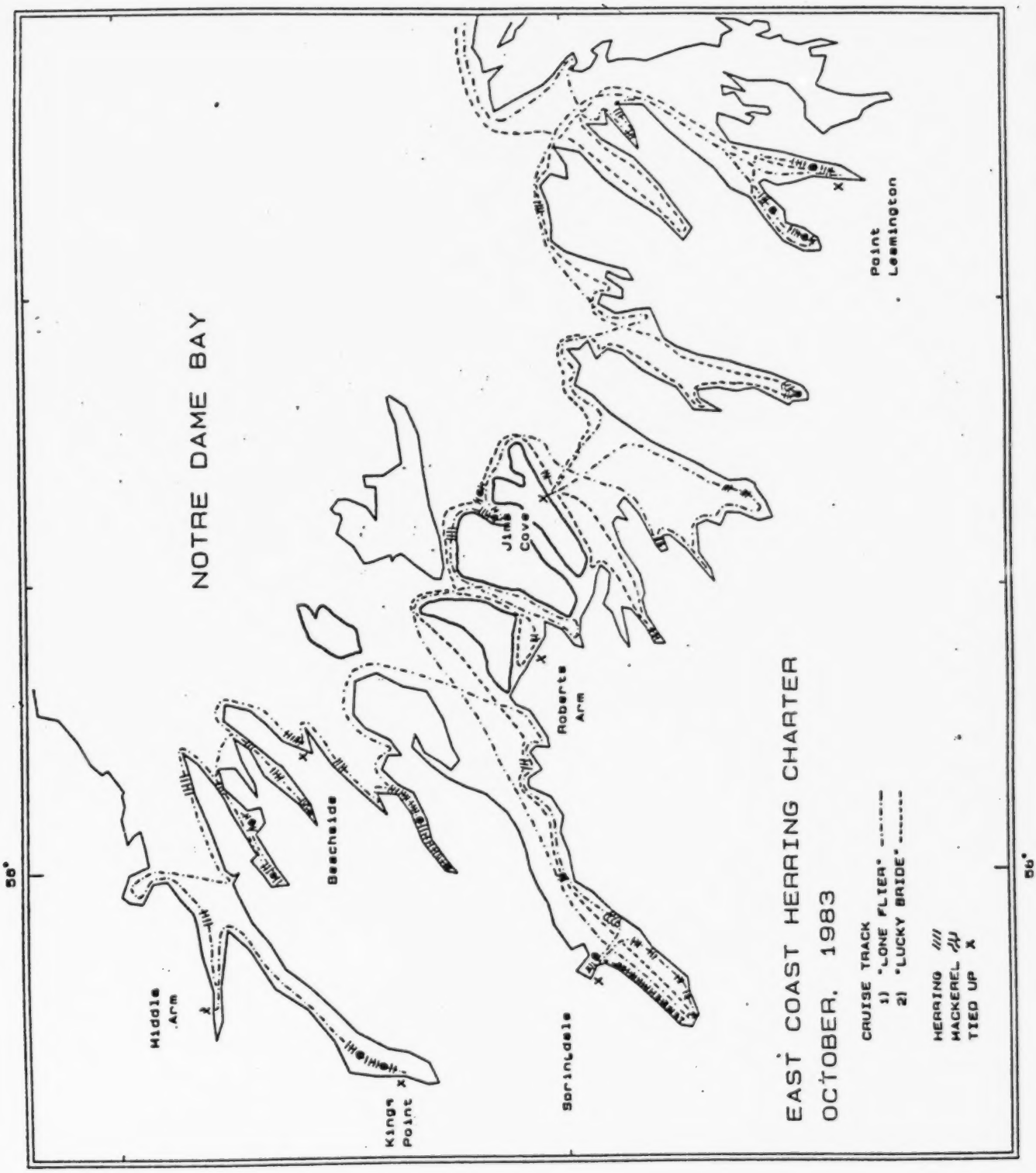

Fig.2. Cruise track, herring markings, and set locations, research purse seine survey, Notre Dame Bay, 1983.

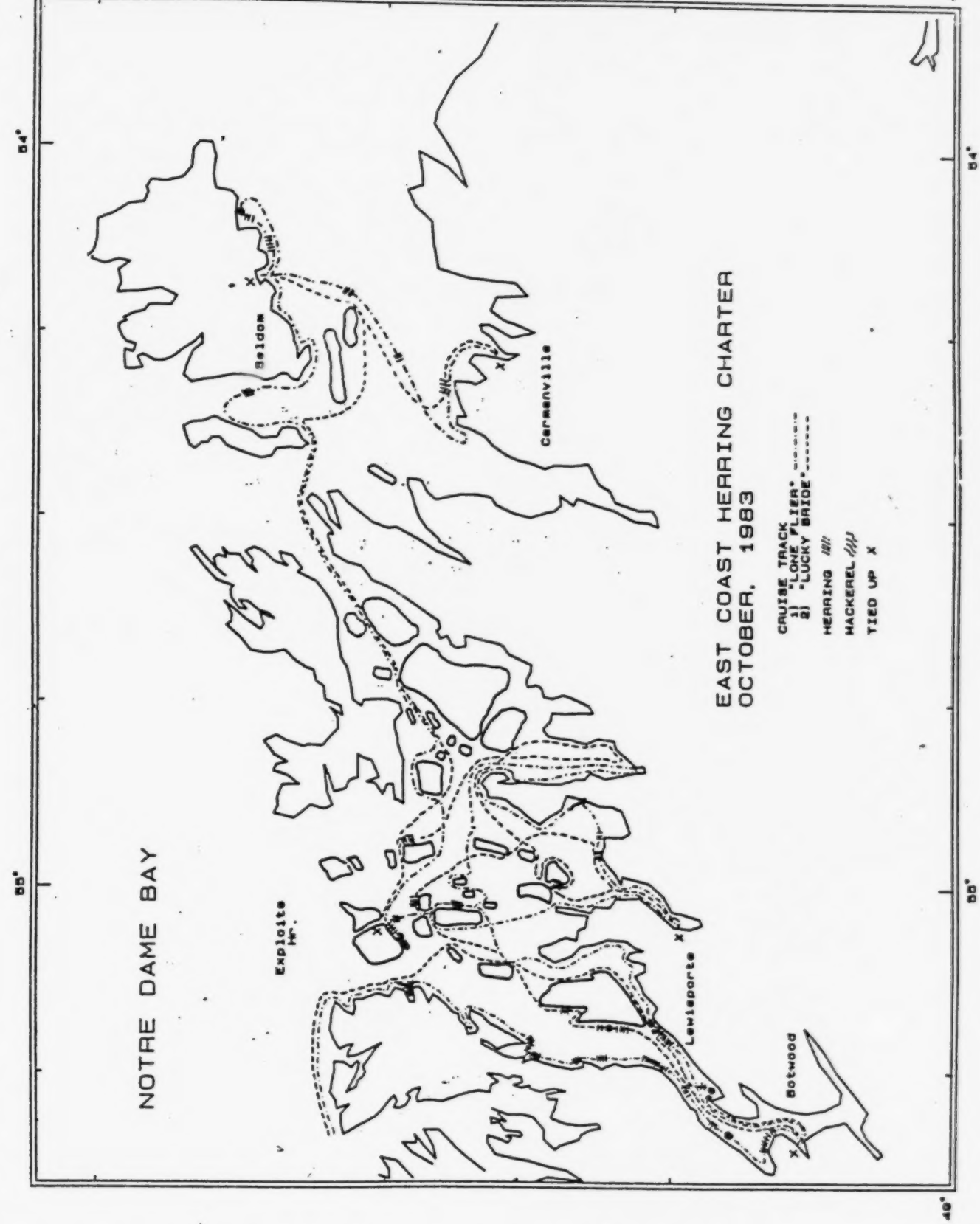

Fig.3. Cruise track, herring markings, and set locations, research purse seine survey, Notre Dame Bay, 1983.

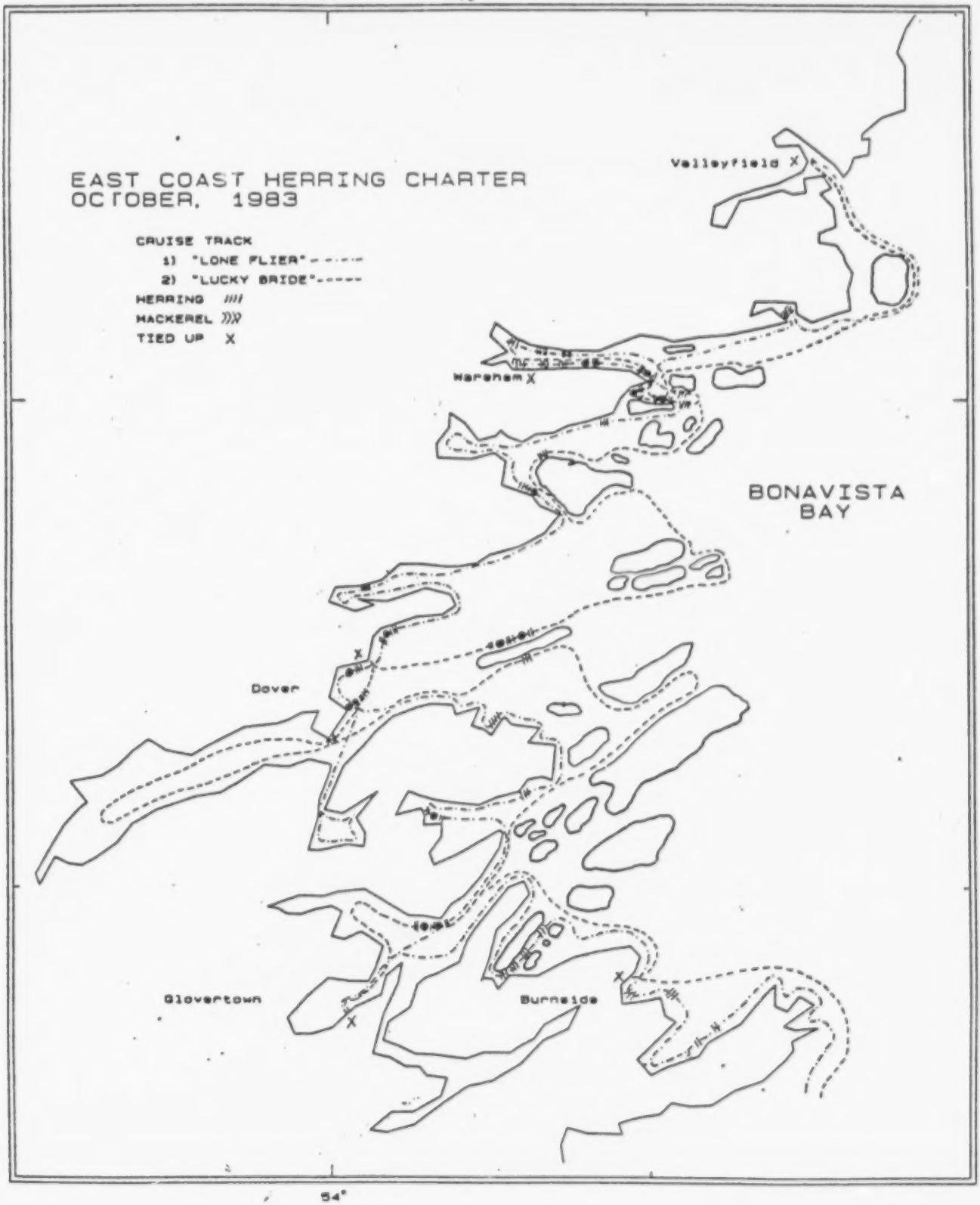

Fig.4. Cruise track, herring markings, and set locations, research purse seine survey, Bonavista Bay, 1983.

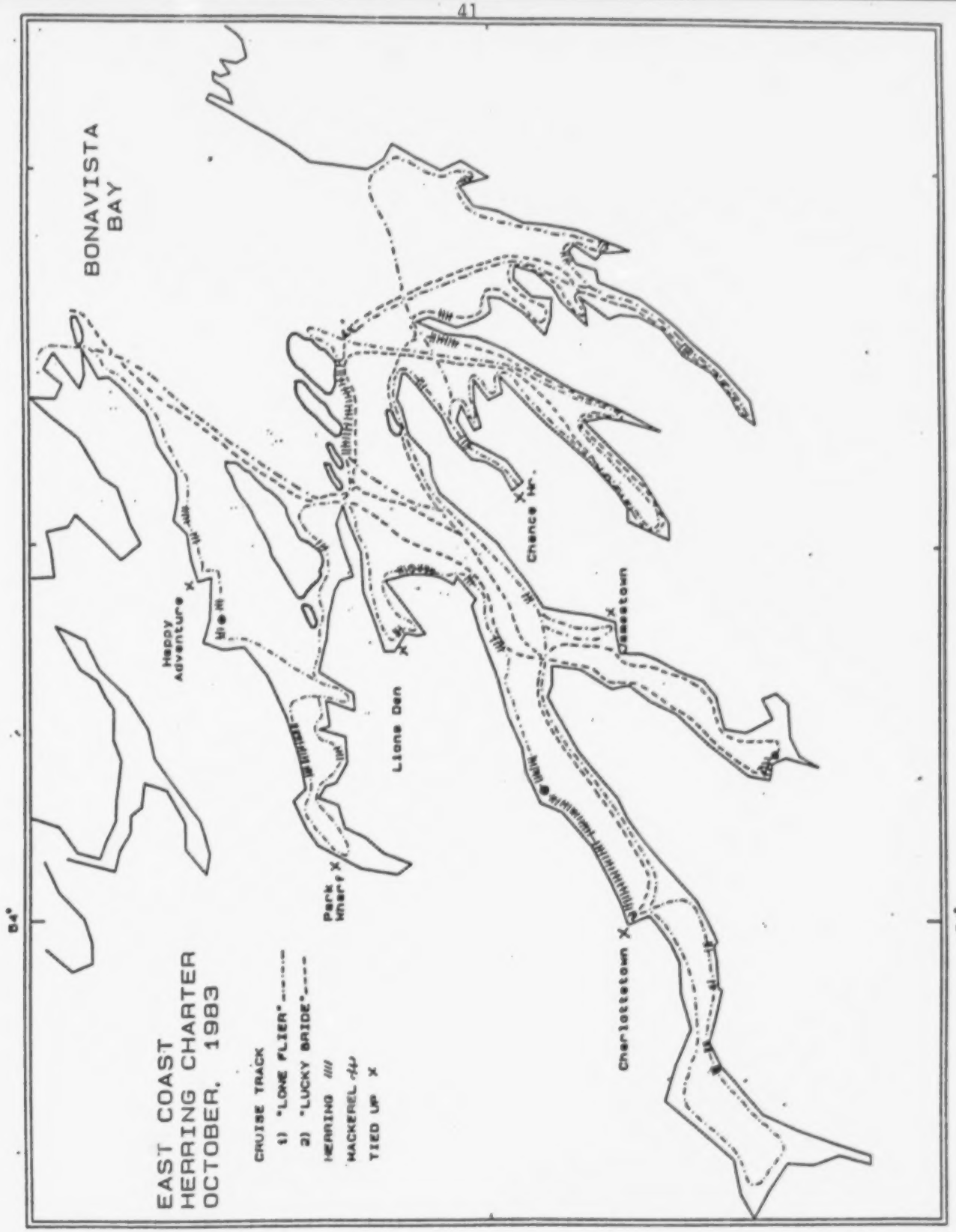

Fig.5. Cruise track, herring markings, and set locations, research purse seine survey, Bonavista Bay, 1983.

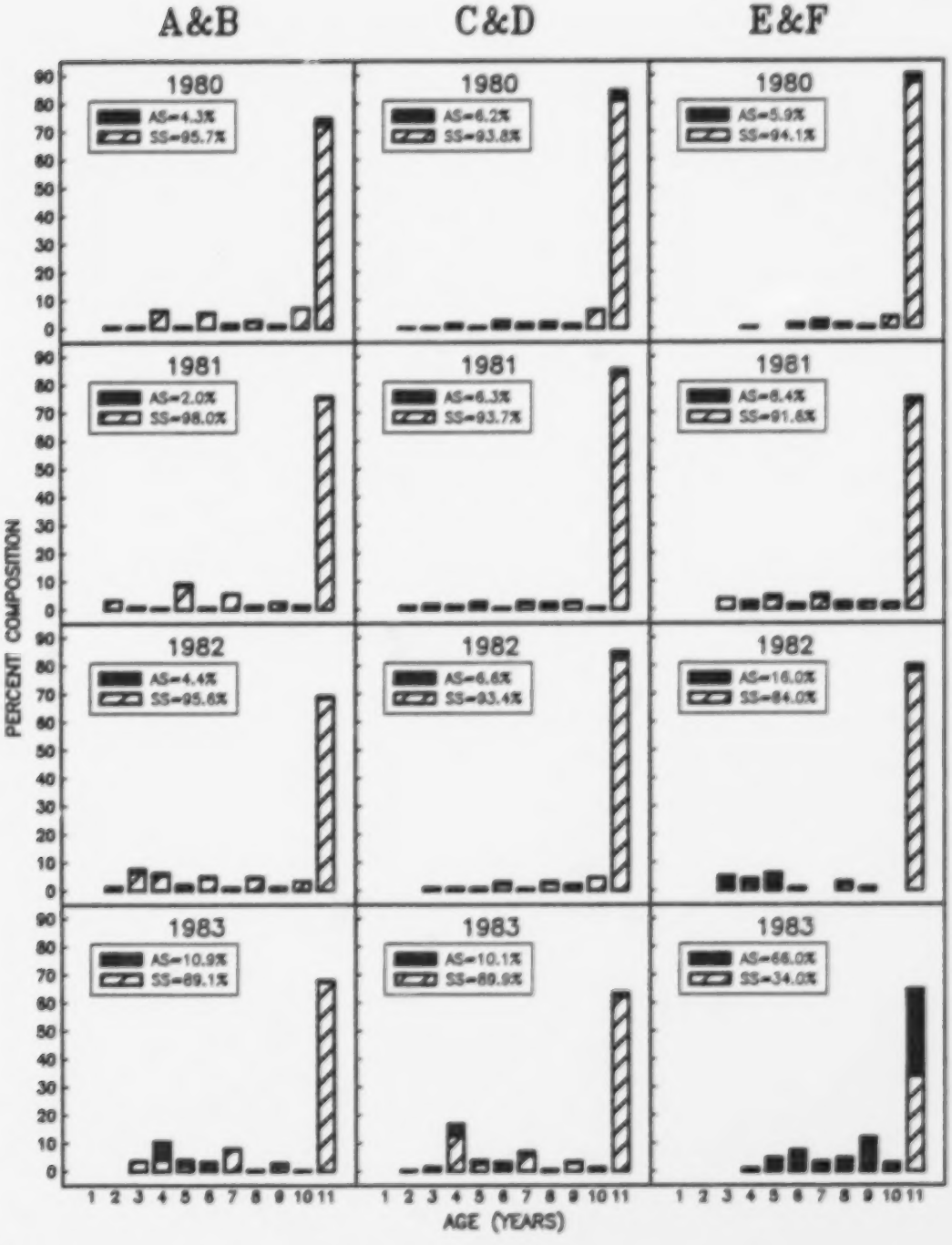

Fig.6. Age composition of herring from commercial fishery, White Bay – Notre Dame Bay, Bonavista Bay – Trinity Bay, and Conception Bay – Southern Shore, 1980–83.

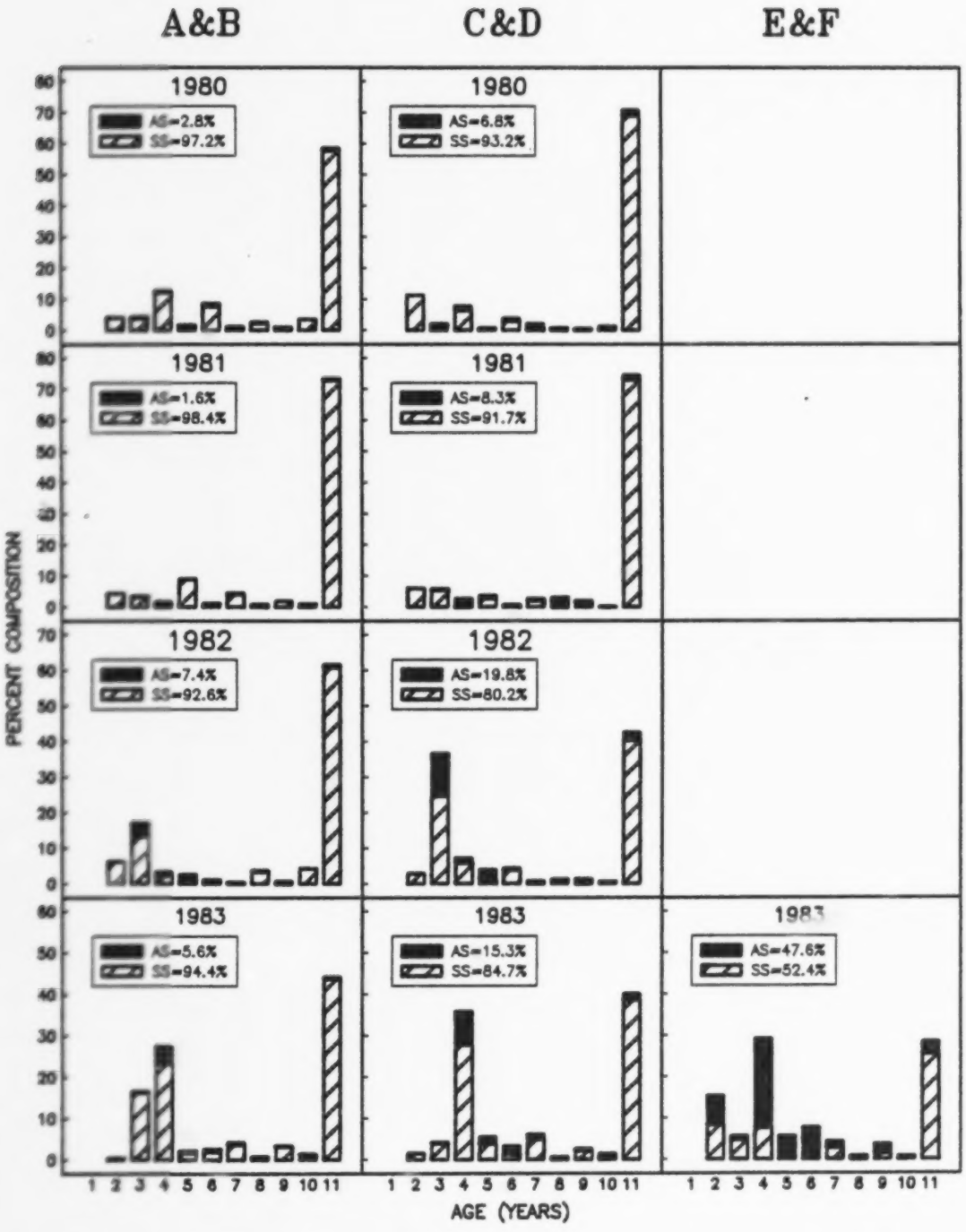

Fig.7. Age composition of herring from research gillnets, White Bay – Notre Dame Bay, Bonavista Bay – Trinity Bay, and Conception Bay – Southern Shore, 1980–83.

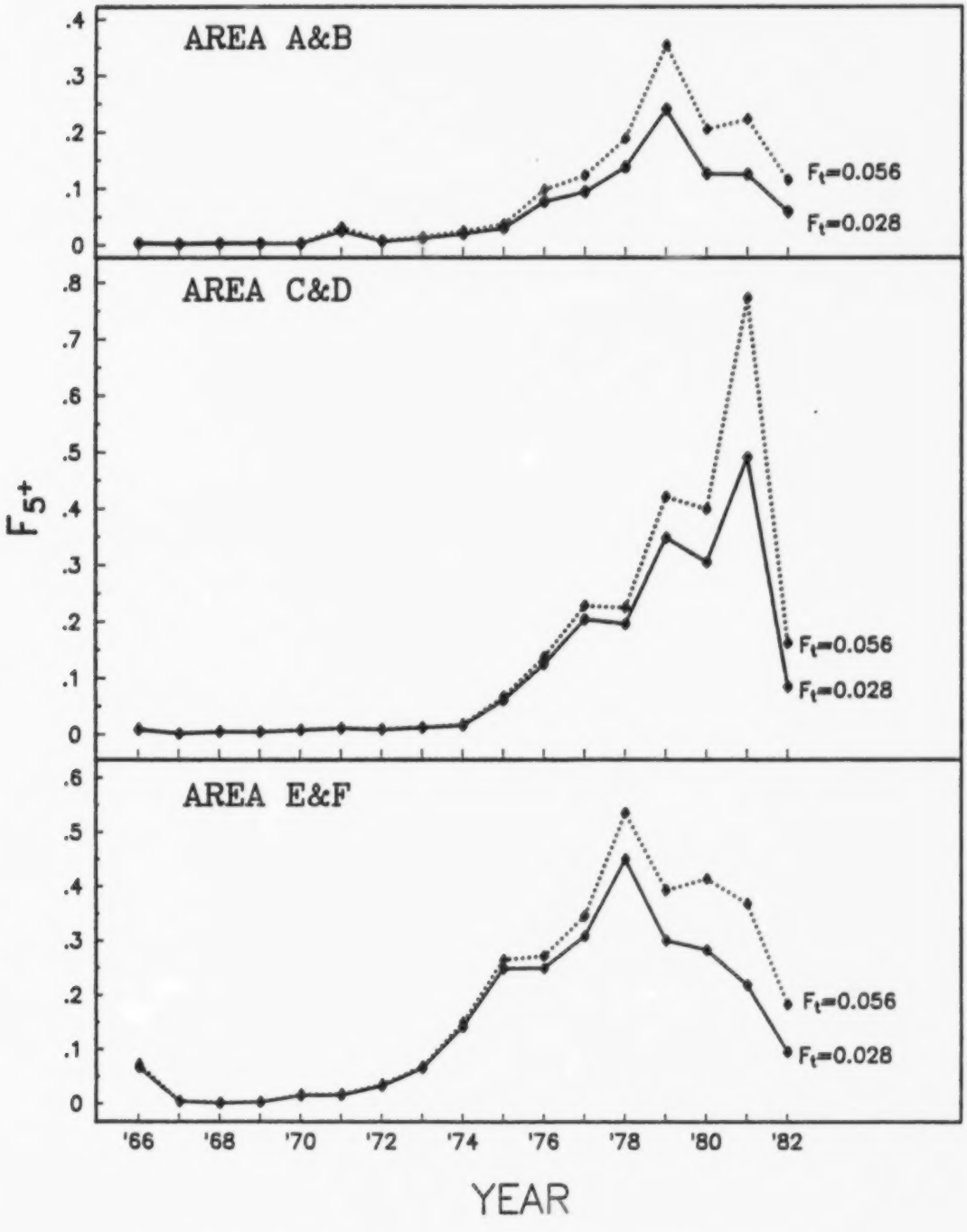

Fig.8. Fishing mortality (F_{5^+}) versus time (1966–82) for east coast Newfoundland herring stocks.

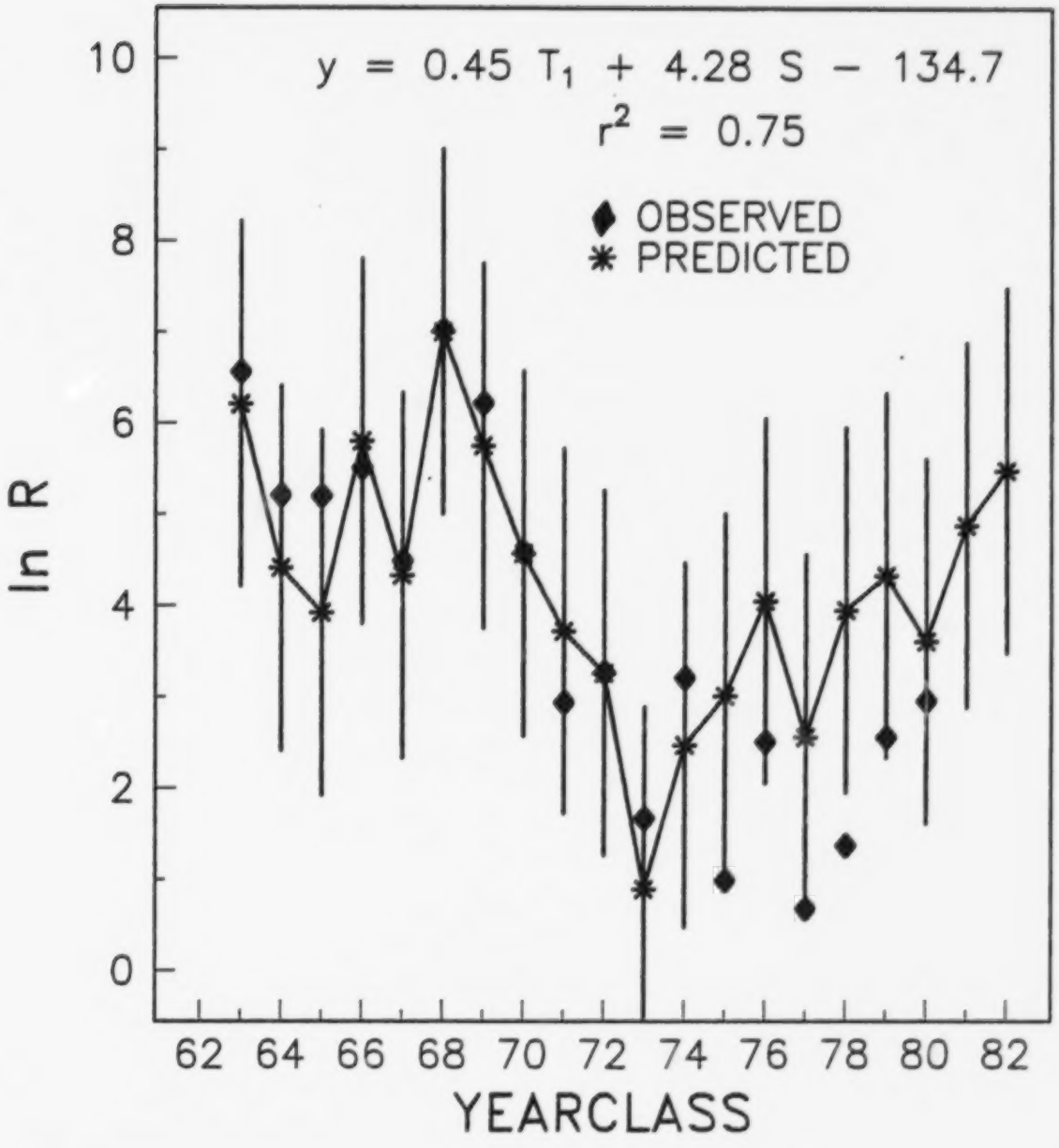

Fig.9. Observed vs. predicted yearclass strengths (1963–80), and predicted yearclass strengths (1981–82) for all east coast Newfoundland herring stocks combined (Areas A–F), using Winters environmental model.

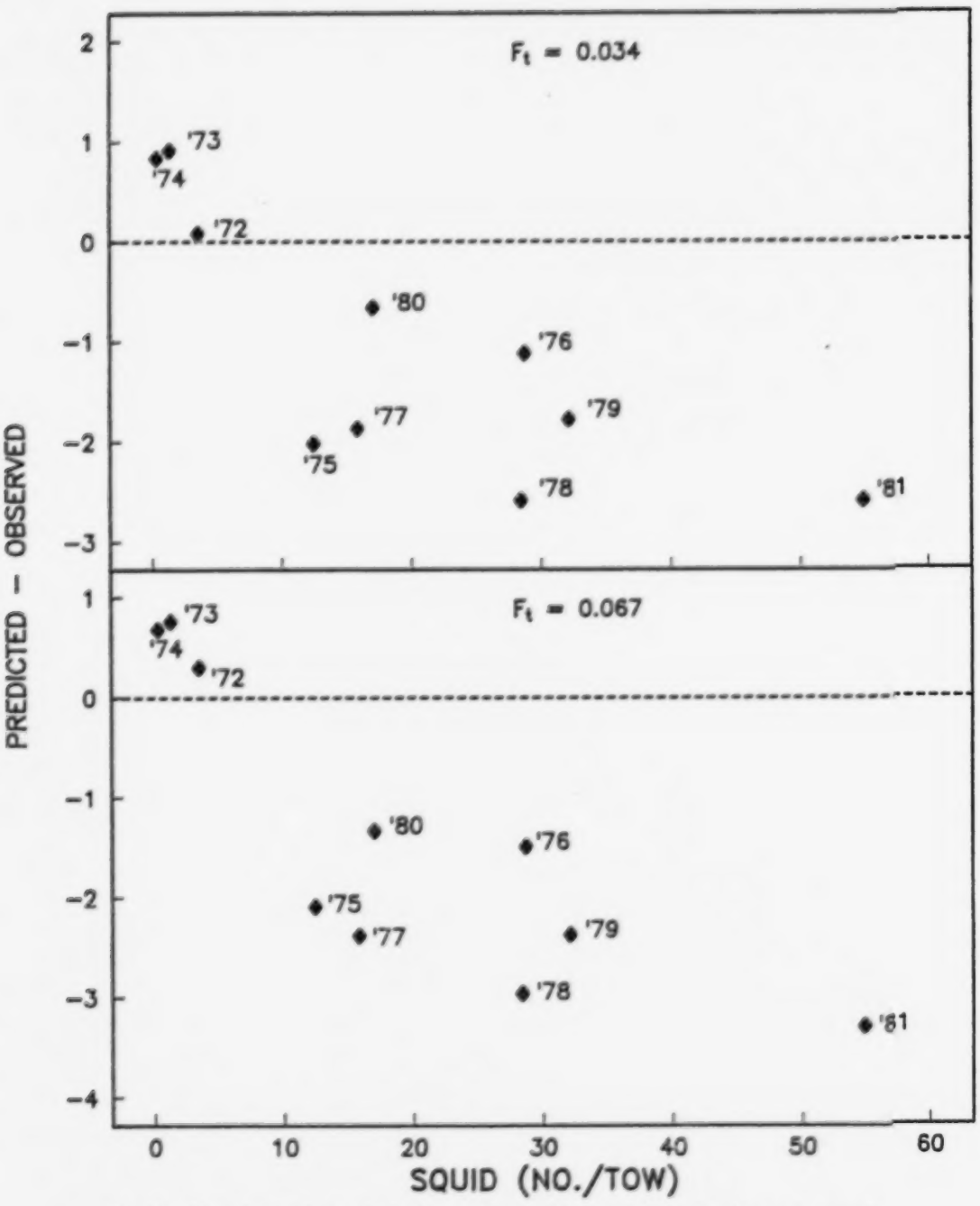

Fig.10. The log of predicted − observed recruitment of east coast Newfoundland herring (stocks combined) vs. squid abundance from research surveys

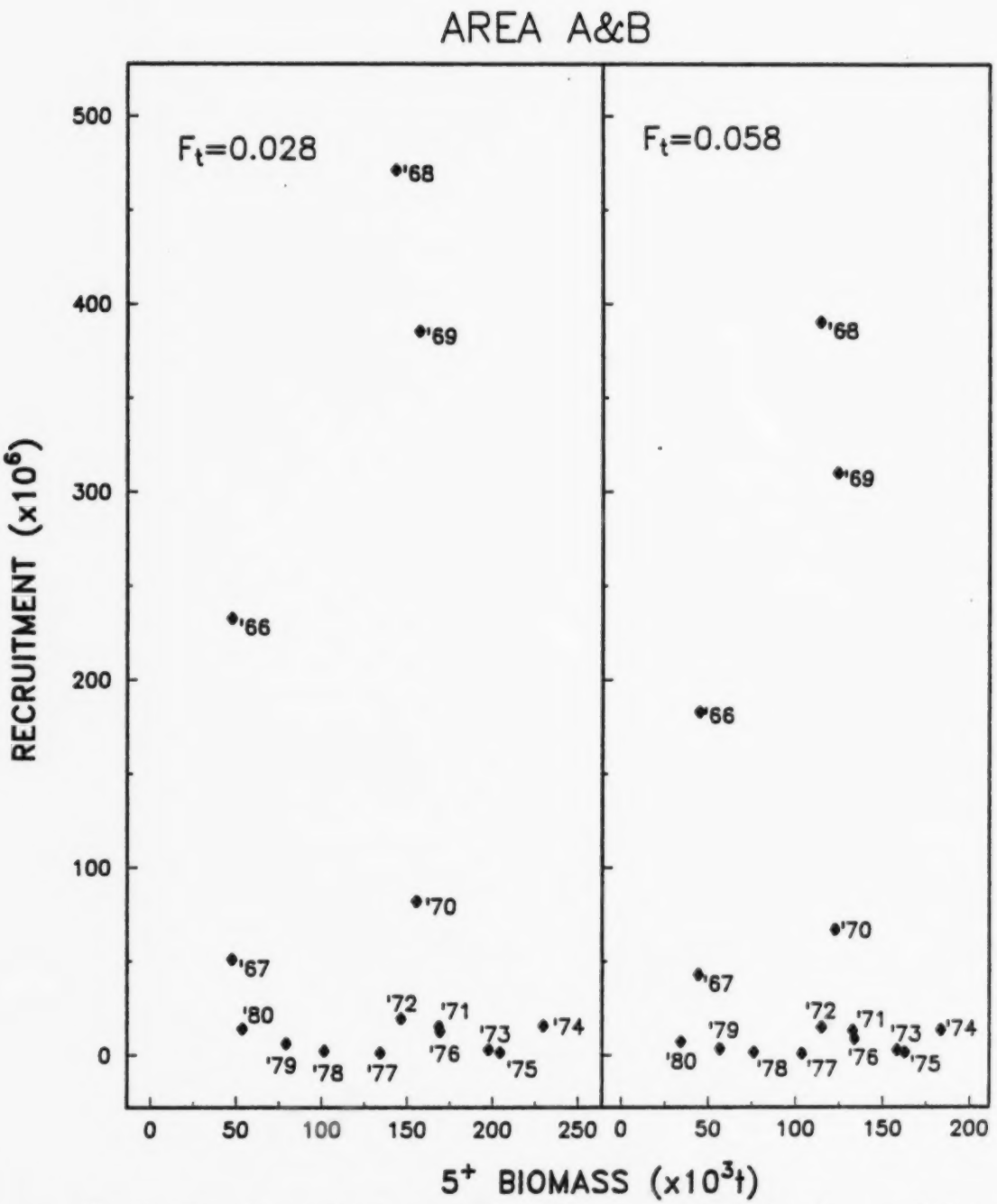

Fig.11. Recriutment vs. spawning biomass for White Bay – Notre Dame Bay, using two options of F_t.

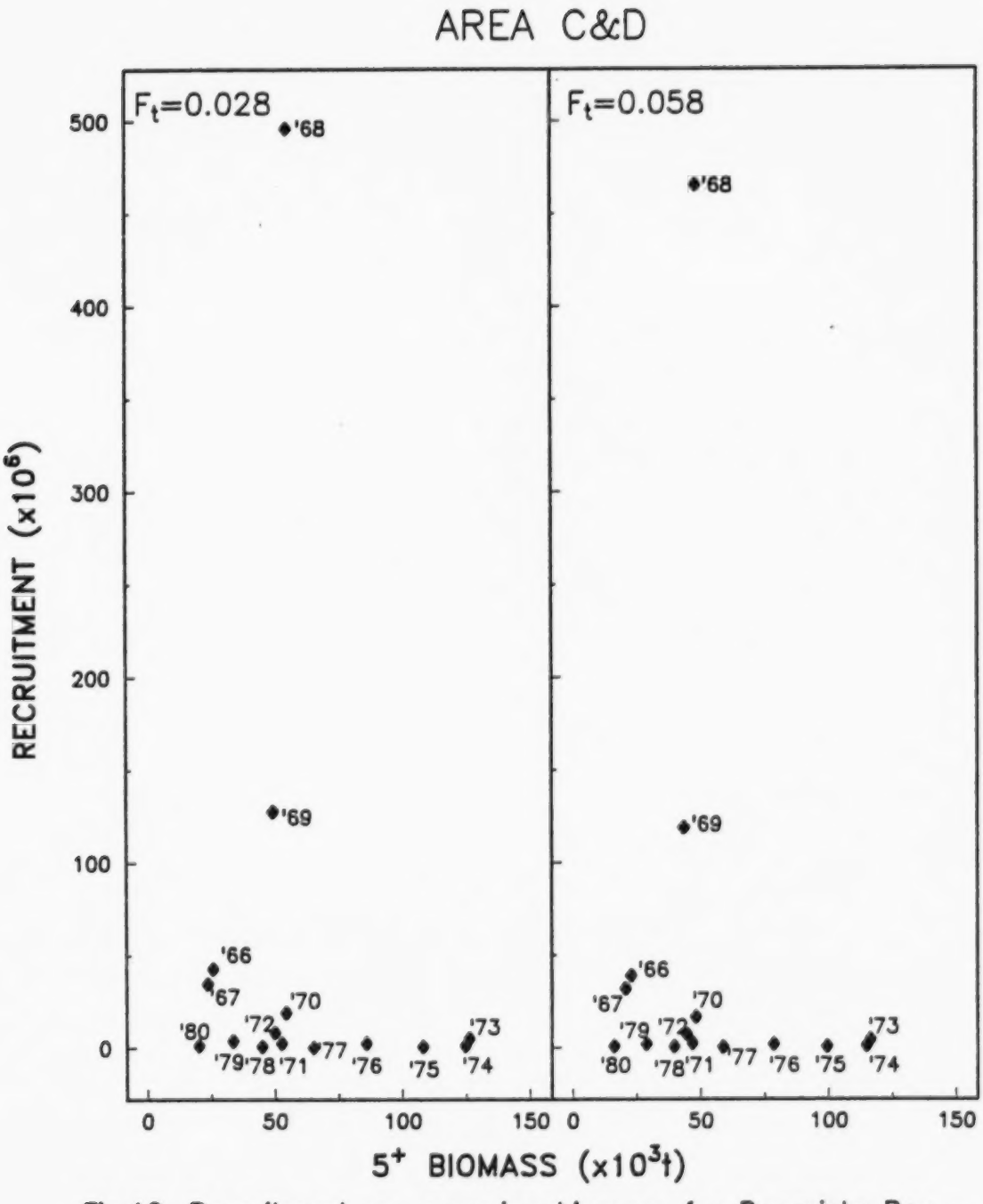

Fig.12. Recruitment vs. spawning biomass for Bonavista Bay – Trinity Bay, using two options of F_t.

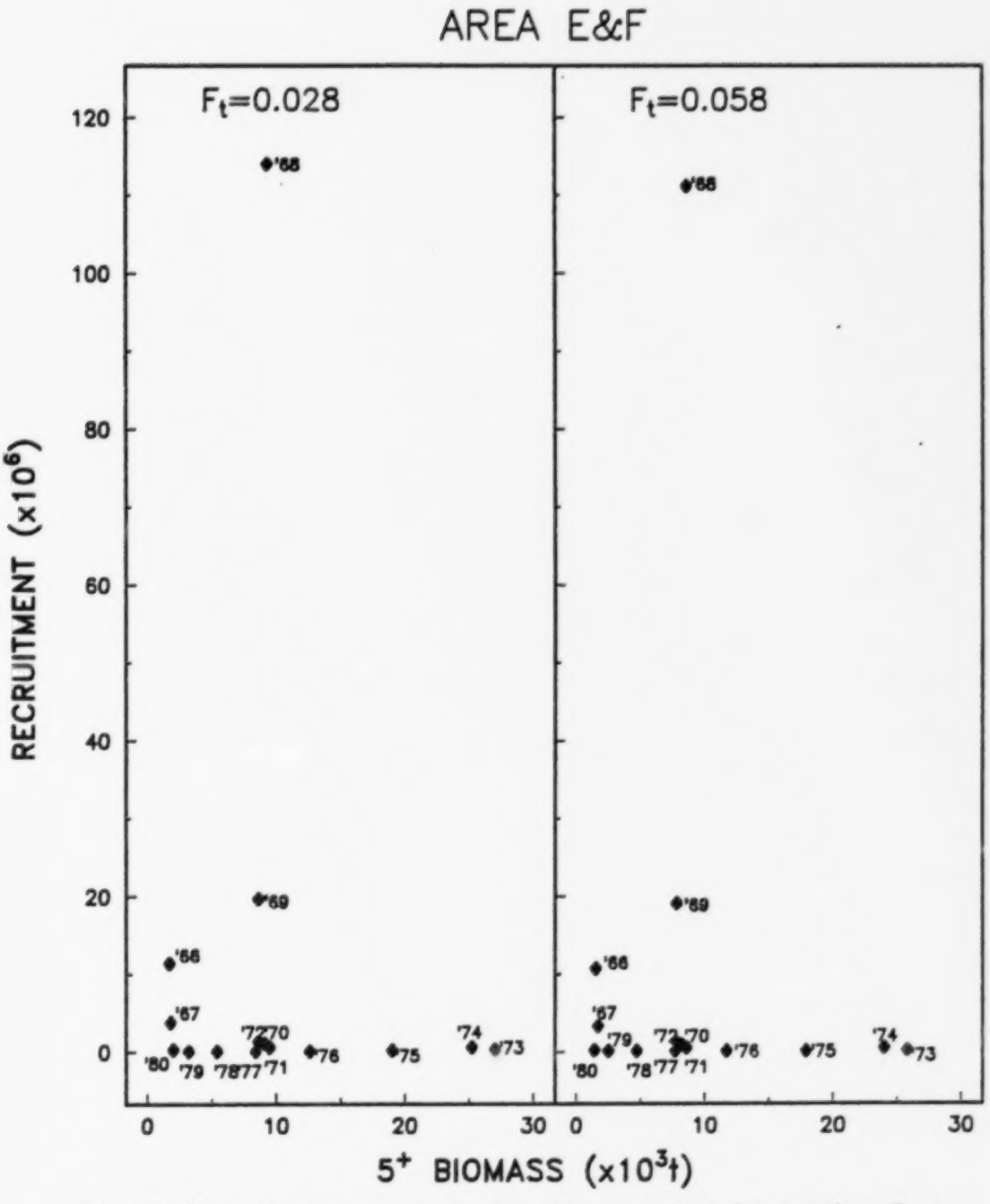

Fig.13. Recruitment vs. spawning biomass for Conception Bay – Southern Shore, using two options of F_t.

Appendix 1a. "Lone Flier" purse seine set locations, dates, times, and catch - October 1983.

Set	Day	Mo.	Yr.	Time	Location	Surface water temp.	Herring Length Range (mean) mm	Mackerel Length Range mm	Comments
1	4	10	83	1615	Kings Point, Green Bay	-	58-93 (69)	150	
2	4	10	83	1710	Kings Point, Green Bay	-	60-82 (68)		
3	5	10	83	0945	Harrys Hr., Western Arm	10.7			No catch
4	5	10	83	1110	West Brook, Western Arm	10.3	163-207 (186)		
5	5	10	83	1440	Dolland Hd., Western Arm	-	167-208 (190)		
6	5	10	83	1635	Bottom Southern Arm	10.8	160-207 (185)		
7	6	10	83	1040	Little Bay Arm	10.9	68-95 (76)		
8	6	10	83	1223	St. Patricks		60-102 (69)		
							132-156 (142)	150	
9	7	10	83	0845	Wolf Cove, Springdale	10.4	62-88 (68)	150	
10	8	10	83	0925	Pilley's Islands Tickle	10.0	166-214 (190)		
11	8	10	83	1102	Stuckey Cove	10.0			No catch
12	9	10	83	1425	West Bottom	10.8			No catch
13	9	10	83	1733	West Bay	11.0			No catch
14	9	10	83	1908	Point Leamington	11.0	160-172 (165)		
15	10	10	83	1222	North Hr., Bay of Exploits	10.0	183-241 (201)		
16	10	10	83	1800	High Point, Botwood	10.0			No catch
17	11	10	83	0912	Gillet Island Cove	9.5	100		
18	12	10	83	2319	Exploits Island Tickle	9.5	178-385 (303)		
19	13	10	83	1809	Kippens Cove, Fogo Island	10.0			No catch
20	13	10	83	1843	Kippens Cove, Fogo Island	10.0	191-253 (206)		
21	18	10	83	1513	Muddy Hole, Indian Bay	9.8			No catch
22	18	10	83	1556	Indian Island	9.8	181-210 (190)		
23	19	10	83	1114	Trinity Gut	10.0			No catch
24	19	10	83	1544	Shoal Bay, Hare Bay	10.0			No catch
25	19	10	83	1644	Off Dover	10.0	166-192 (179)		
26	20	10	83	1106	Hare Island Tickle	9.8			No catch
27	20	10	83	1147	Hare Island Tickle	9.8	152-185 (172)		
28	20	10	83	1522	Rocky Bay	9.8			No catch
29	22	10	83	1529	North Broad Cove	9.8	172-206 (188)		
30	24	10	83	0948	Sugar Loaf Cove	9.5	308-404 (367)		
							168-210 (188)		
31	24	10	83	1333	Johnston's Cove	10.0	91-208 (185)		
32	28	10	83	0915	Hare Island	9.0	200		

Appendix 1b. "Lucky Bride" purse seine set locations, dates, times, and catch - October 1983.

Set	Day	Mo.	Yr.	Time	Location	Surface water temp.	Herring Length Range (mean) mm	Mackerel Length Range mm	Comments
1	8	10	83	1030	Fox Cove, Pilley's Tickle	-			No catch
2	8	10	83	1545	Sops Arm, Badger Bay	9.9			No catch
3	8	10	83	1645	Sops Arm, Badger Bay	-	161-192 (175)		
4	9	10	83	1105	Seal Bay	10.9		104-164 (145)	
5	10	10	83	1800	Laurenceton, Bay of Exp.	10.3	77-96 (85)		
6	11	10	83	0935	Thwart Island, Bay of Exp.	10.0			No catch
7	18	10	83	1455	North Arm, Indian Bay	9.2			No catch
8	18	10	83	1805	South Side, Indian Bay	9.2	182-264 (191)		
9	19	10	83	1440	Lockers Flat Island	10.1	172-200 (182)		
10	19	10	83	1620	Lockers Flat Island	10.0	171-198 (182)		
11	20	10	83	0835	Hare Bay Island	9.8			No catch
12	21	10	83	1125	Wolf Island, Bloody Reach	9.8			No catch
13	21	10	83	1220	Wolf Island, Bloody Reach	9.8			
14	24	10	83	1450	Bloomfield, Goose Bay	9.7	171-208 (182)	200	

Appendix 2a. Actual catch-at-age (numbers of herring) from research gillnets, by area and community (* indicates shallow nets).

Area	Community	Age	Year 1980	1981	1982	1983
A	WESTPORT	1	2*	0*	0*	0
		2	190	132	258	41
		3	209	93	452	1954
		4	37	39	86	1393
		5	49	0	37	202
		6	126	16	8	79
		7	12	39	0	10
		8	41	2	71	20
		9	16	12	0	145
		10	59	13	52	43
		11+	1389	682	1411	529
		C3+	1938	896	2117	4375
		C4+	1729	803	1665	2421
A	LA SCIE	1	0*	0	-	-
		2	79	73	-	-
		3	0	59	-	-
		4	0	0	-	-
		5	22	0	-	-
		6	105	0	-	-
		7	0	179	-	-
		8	122	0	-	-
		9	10	89	-	-
		10	258	37	-	-
		11+	5681	3823	-	-
		C3+	6198	4187	-	-
		C4+	6198	4128	-	-

Appendix 2b. Actual catch-at-age (numbers of herring) from research gillnets, by area and community.

Area	Community	Age	Year 1980	1981	1982	1983
A	BRENTS COVE	1	-	-	0	0
		2	-	-	66	0
		3	-	-	717	664
		4	-	-	267	2645
		5	-	-	229	432
		6	-	-	137	612
		7	-	-	63	871
		8	-	-	792	54
		9	-	-	0	933
		10	-	-	1340	45
		11+	-	-	16254	11064
		C3+	-	-	19799	17320
		C4+	-	-	19082	16656
B	HARRY'S HR.	1	-	0	-	0
		2	-	3	-	0
		3	-	24	-	3732
		4	-	0	-	5166
		5	-	7	-	87
		6	-	8	-	449
		7	-	105	-	1579
		8	-	10	-	173
		9	-	43	-	1075
		10	-	20	-	448
		11+	-	2178	-	21423
		C3+	-	2395	-	34132
		C4+	-	2371	-	30400

Appendix 2c. Actual catch-at-age (numbers of herring) from research gillnets, by area and community (* indicates shallow nets).

Area	Community	Age	Year 1980	1981	1982	1983
B	LEADING TICKLES	1	-	0	-	0
		2	-	62	-	0
		3	-	10	-	569
		4	-	10	-	1714
		5	-	108	-	132
		6	-	27	-	273
		7	-	72	-	587
		8	-	14	-	47
		9	-	59	-	352
		10	-	37	-	316
		11+	-	2497	-	6646
		C3+	-	2834	-	10636
		C4+	-	2824	-	10067
B	HILLGRADE	1	0*	0*	0*	0
		2	250	67	0	7
		3	79	146	0	48
		4	10407	25	0	194
		5	413	1258	0	0
		6	4781	24	0	3
		7	88	223	0	7
		8	1293	0	0	2
		9	397	55	0	0
		10	1810	6	0	0
		11+	18654	943	0	24
		C3+	37922	2680	0	278
		C4+	37843	2534	0	230

Appendix 2d. Actual catch-at-age (numbers of herring) from research gillnets, by area and community (* indicates shallow nets).

Area	Community	Age	Year 1980	1981	1982	1983
A+B	COMBINED	1	2	0	0	0
		2	519	337	324	48
		3	288	332	1169	6967
		4	10444	74	353	11112
		5	484	1373	266	853
		6	5012	75	145	1416
		7	100	618	63	3054
		8	1456	26	863	296
		9	423	258	0	2505
		10	2127	113	1392	852
		11+	25724	10123	17665	39686
		C3+	46058	12992	21916	66741
		C4+	45770	12660	20747	59774
C	CENTRE-VILLE	1	0*	0*	0	0
		2	37	38	47	16
		3	19	58	330	0
		4	35	0	81	412
		5	0	9	6	27
		6	56	9	71	16
		7	4	19	6	93
		8	3	0	13	0
		9	3	21	0	49
		10	17	0	14	9
		11+	816	679	801	805
		C3+	953	795	1322	1411
		C4+	934	737	992	1411

Appendix 2e. Actual catch-at-age (numbers of herring) from research gillnets, by area and community (* indicates shallow nets).

Area	Community	Age	Year 1980	1981	1982	1983
C	SALVAGE	1	0*	0*	0	0
		2	801	7	263	0
		3	45	12	4696	1438
		4	466	0	1134	9553
		5	31	7	208	1166
		6	123	0	727	442
		7	11	9	0	759
		8	31	0	145	0
		9	11	1	0	263
		10	76	0	56	188
		11+	2615	182	2955	5828
		C3+	3409	211	9921	19637
		C4+	3364	199	5225	18199
C	PORTLAND	1	-	0	0	-
		2	-	31	87	-
		3	-	86	843	-
		4	-	18	133	-
		5	-	76	25	-
		6	-	0	142	-
		7	-	196	0	-
		8	-	0	77	-
		9	-	102	0	-
		10	-	3	21	-
		11+	-	6188	1258	-
		C3+	-	6669	2499	-
		C4+	-	6583	1656	-

Appendix 2f. Actual catch-at-age (numbers of herring) from research gillnets, by area and community.

Area	Community	Age	Year 1980	1981	1982	1983
C	CHARLOTTE-TOWN	1	-	-	-	0
		2	-	-	-	138
		3	-	-	-	86
		4	-	-	-	2497
		5	-	-	-	179
		6	-	-	-	163
		7	-	-	-	346
		8	-	-	-	0
		9	-	-	-	198
		10	-	-	-	73
		11+	-	-	-	6202
		C3+	-	-	-	9744
		C4+	-	-	-	9658
D	PORT REXTON	1	-	-	0	0
		2	-	-	63	92
		3	-	-	74	832
		4	-	-	49	5465
		5	-	-	12	1040
		6	-	-	19	195
		7	-	-	0	1376
		8	-	-	20	36
		9	-	-	0	537
		10	-	-	11	0
		11+	-	-	1447	7600
		C3+	-	-	1632	17081
		C4+	-	-	1558	16249

Appendix 2g. Actual catch-at-age (numbers of herring) from research gillnets, by area and community (* indicates shallow nets).

Area	Community	Age	Year 1980	1981	1982	1983
D	HICKMANS HARBOUR	1	0*	0*	0	-
		2	50	1	5	-
		3	22	1	5	-
		4	51	0	4	-
		5	9	1	1	-
		6	49	0	2	-
		7	6	1	0	-
		8	0	0	2	-
		9	0	1	0	-
		10	13	0	1	-
		11+	1948	75	134	-
		C3+	2098	79	149	-
		C4+	2076	78	144	-
D	LONG BEACH		-	-	-	0
		2	-	-	-	79
		3	-	-	-	85
		4	-	-	-	118
		5	-	-	-	14
		6	-	-	-	5
		7	-	-	-	23
		8	-	-	-	0
		9	-	-	-	13
		10	-	-	-	0
		11+	-	-	-	262
		C3+	-	-	-	520
		C4+	-	-	-	435

Appendix 2h. Actual catch-at-age (numbers of herring) from research gillnets, by area and community.

Area	Community	Age	Year 1980	1981	1982	1983
C&D	COMBINED		0	0	0	0
		2	888	77	465	325
		3	86	157	5948	2441
		4	552	18	1401	18045
		5	40	93	252	2426
		6	228	9	961	821
		7	21	225	6	2597
		8	34	0	257	36
		9	14	125	0	1060
		10	106	3	103	270
		11+	5379	7124	6595	20697
		C3+	6460	7754	15523	48393
		C4+	6374	7597	9575	45952